A330-200/300
TECHNICAL TRAINING MANUAL
GENERAL FAMILIARIZATION COURSE - T4 (RR Trent 700)
PART 1 OUT OF 2

This document must be used for training purposes only

Under no circumstances should this document be used as a reference

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PART 1 OUT OF 2

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00 LR FAMILY PRESENTATION (1)

AIRBUS MANUFACTURING OPERATIONS IN EUROPE

Airbus manufacturing takes place in different sites in Europe and is managed by Airbus.

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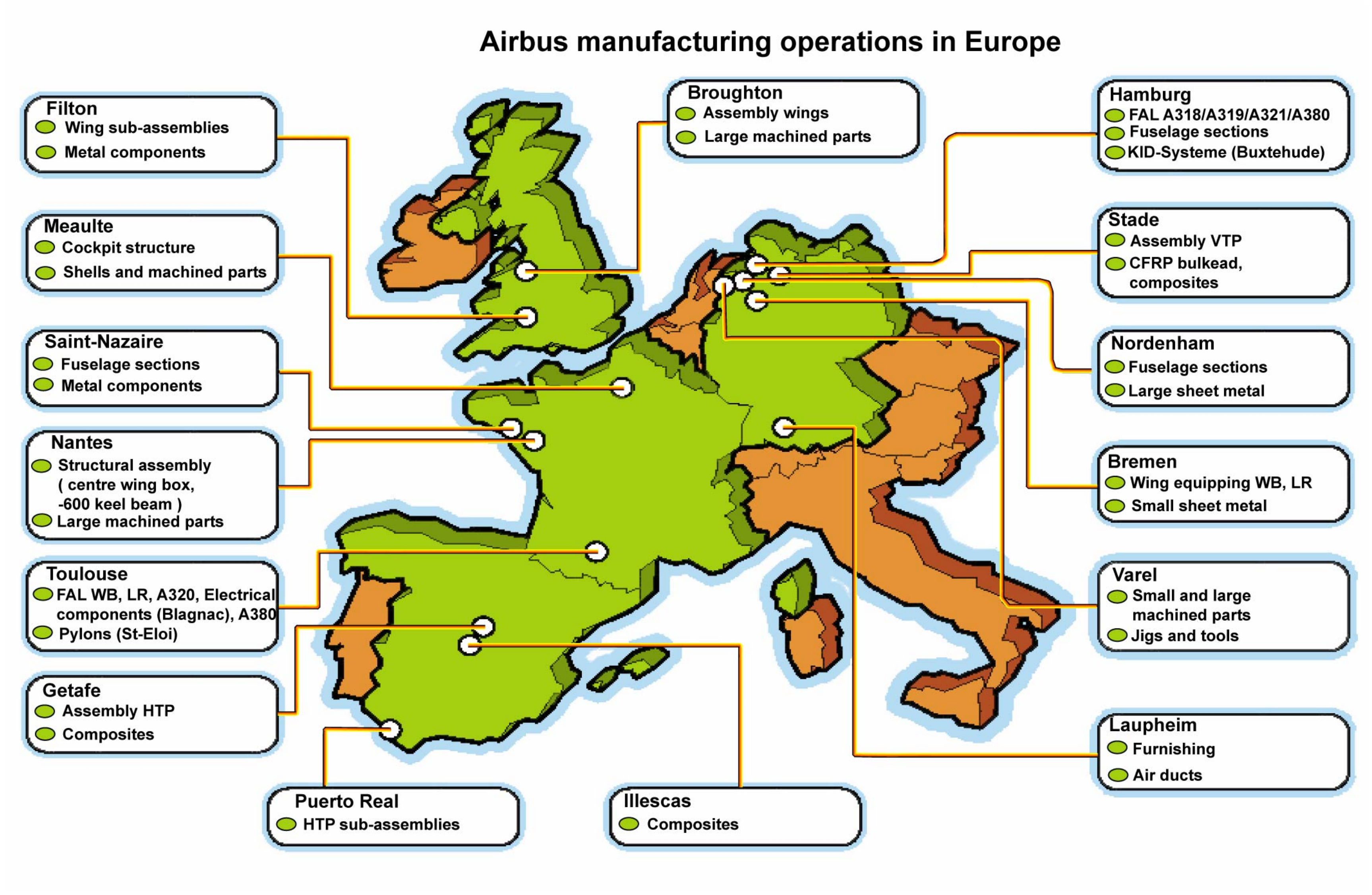


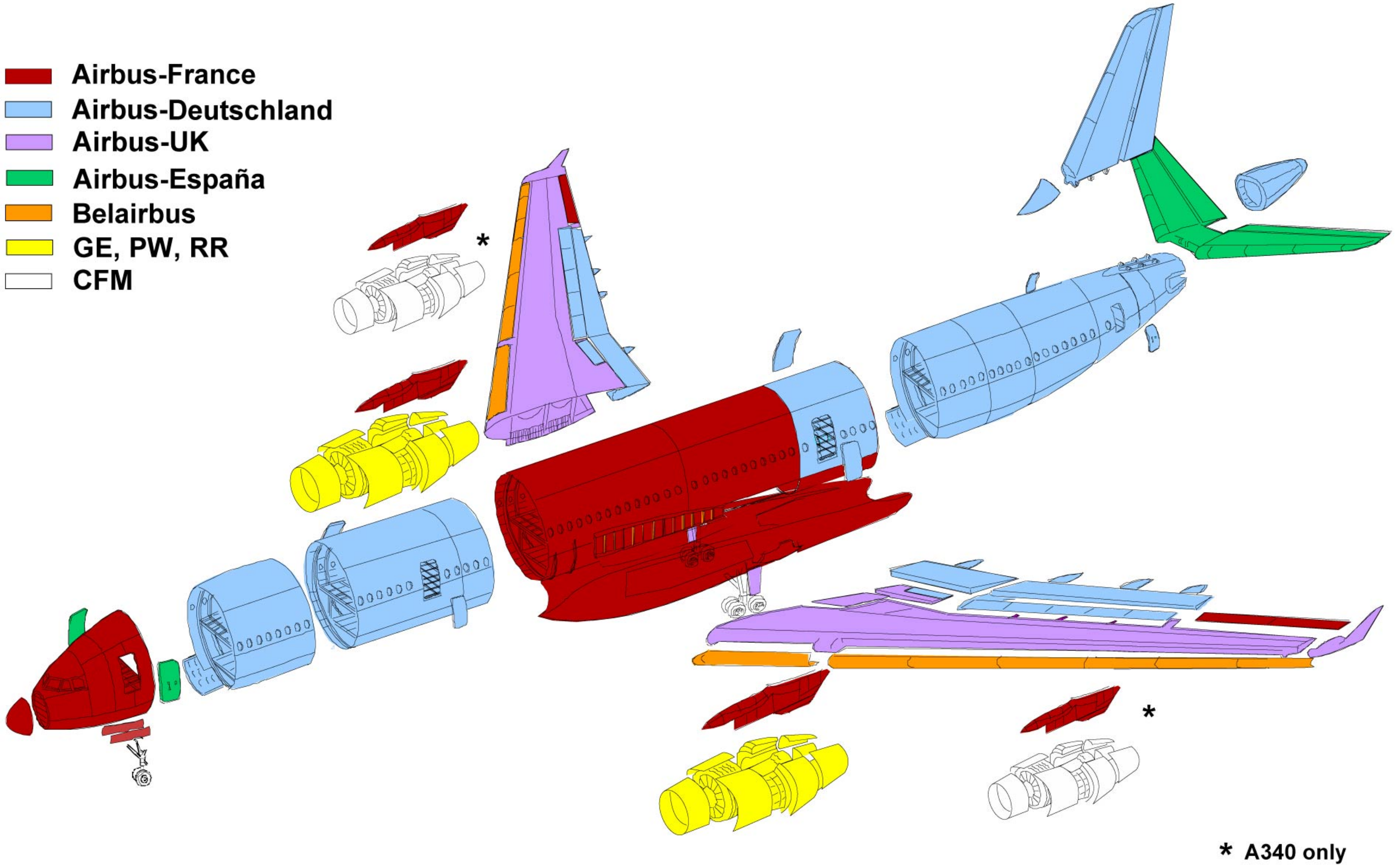
AIRBUS MANUFACTURING OPERATIONS IN EUROPE

00 LR FAMILY PRESENTATION (1)

AIRBUS MANUFACTURING OPERATIONS IN EUROPE (continued)

A330-200/300 - A340-300 PRODUCTION SHARING

The manufacturing is a Trans-national process, structured around key manufacturing units, each unit is responsible for producing a complete section of the aircraft.



A330-200/300 - A340-300 Production Sharing

AIRBUS MANUFACTURING OPERATIONS IN EUROPE - A330-200/300 - A340-300 PRODUCTION SHARING

00 LR FAMILY PRESENTATION (1)

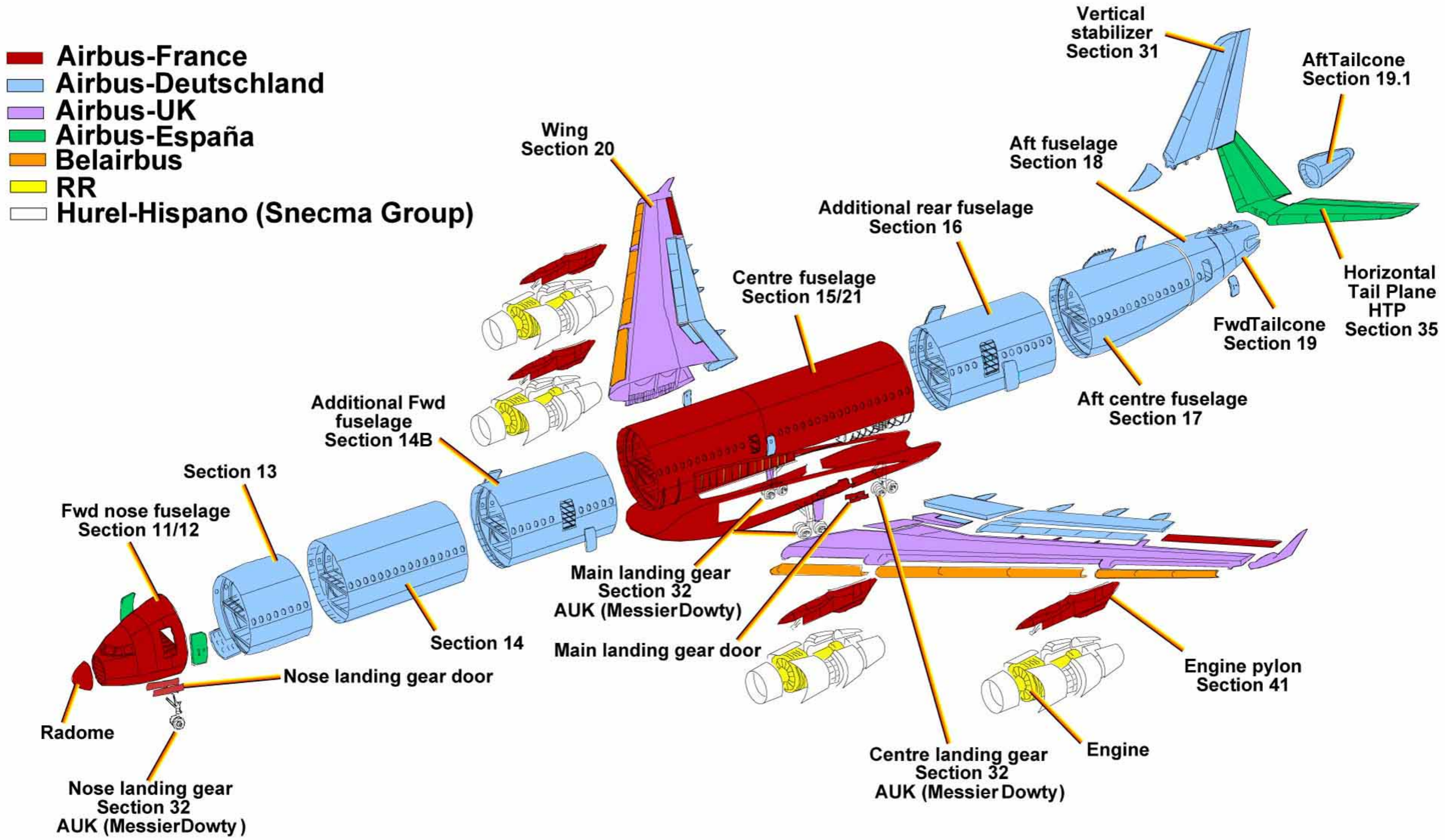
AIRBUS MANUFACTURING OPERATIONS IN EUROPE (continued)

AIRCRAFT VIDEO PRESENTATION

The A340 and A330 use the same assembly line since most of the A/C systems are similar.

A340-500/600 PRODUCTION SHARING

At the difference of the A330/A340-200/300, only Rolls Royce manufactures the engines of the A340-500/600.
Hurel-Hispano produces the nacelles of the engines. And all the section 15/21 upper shells are made by airbus - France.



A340-500/600 Production Sharing

AIRBUS MANUFACTURING OPERATIONS IN EUROPE - AIRCRAFT VIDEO PRESENTATION & A340-500/600 PRODUCTION SHARING

00 LR FAMILY PRESENTATION (1)

ASSEMBLY PROCESS OF AN AIRCRAFT

The Airbus Super Transporter, A300-600ST, transports the different aircraft sections of all A330/A340 versions to the final assembly lines in Toulouse.

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00 ZONE AND STATION PRESENTATION (1)

GENERAL

The A/C general information presentation is divided into:
- the reference axes,
- the A/C dimensions,
- the section and station numbers,
- the zone presentation,
- the access panels.

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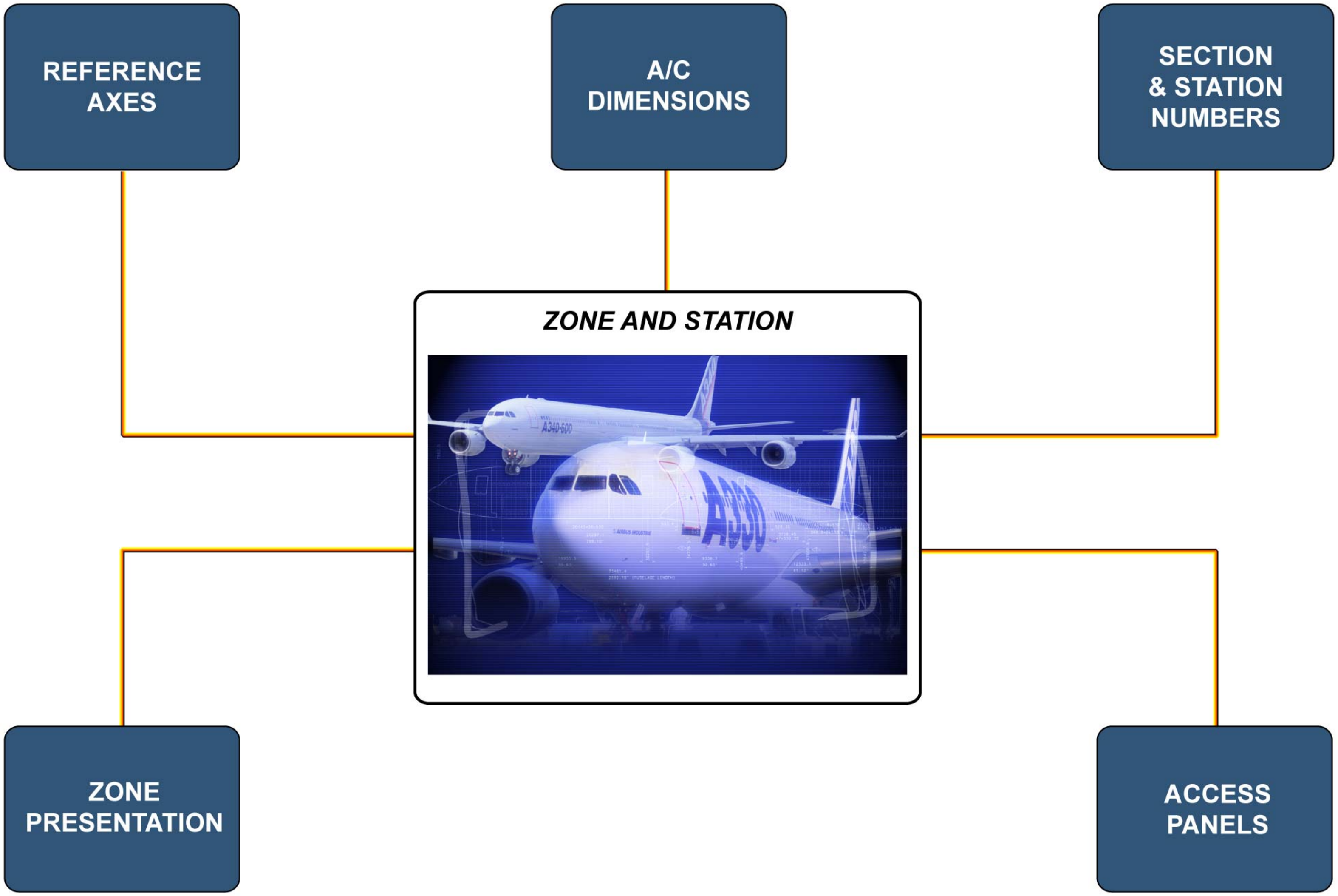

REFERENCE AXES
A/C DIMENSIONS
SECTION & STATION NUMBERS
ZONE AND STATION
ZONE PRESENTATION
ACCESS PANELS

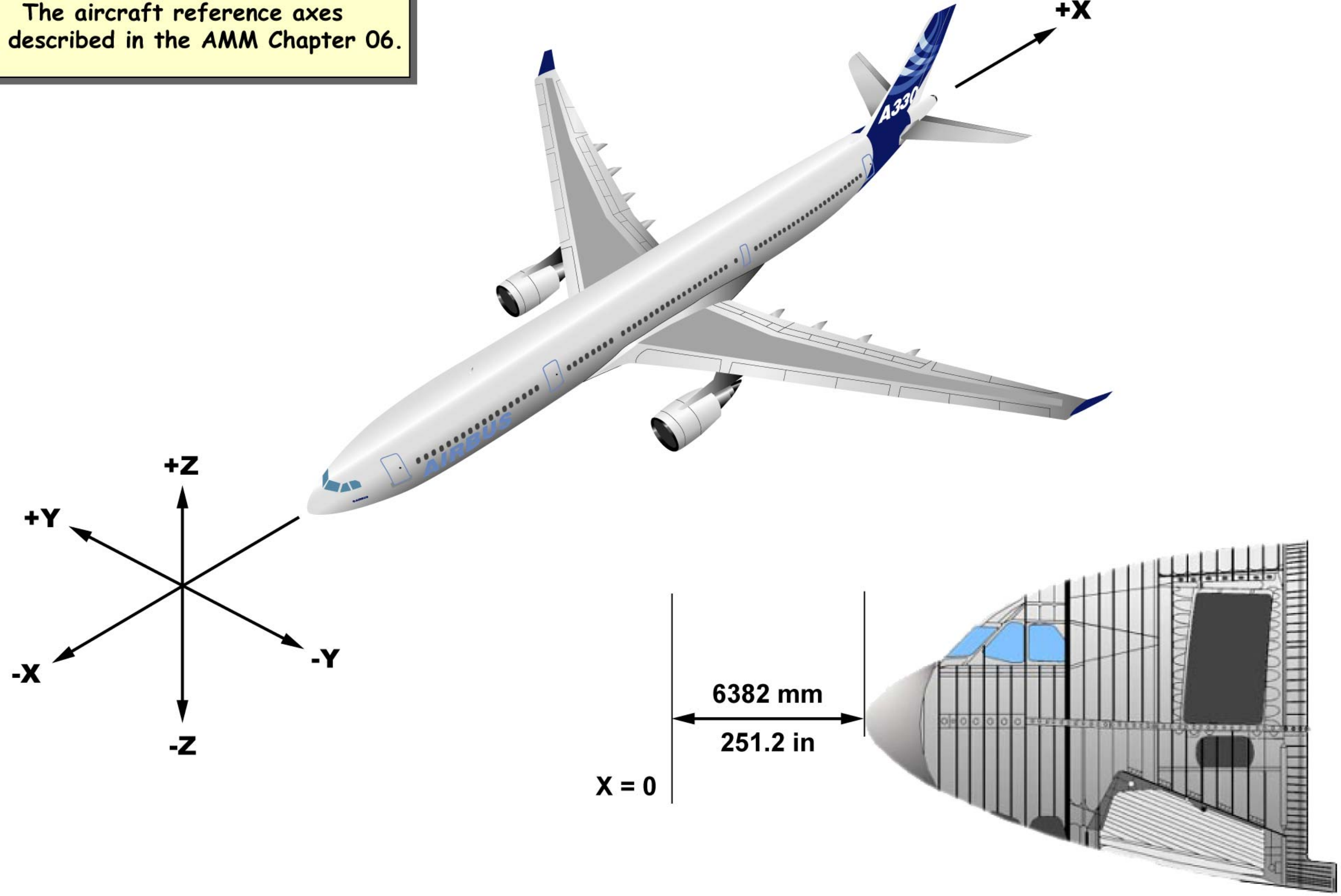
GENERAL

00 ZONE AND STATION PRESENTATION (1)

REFERENCE AXES

The structure elements are identified according to the following reference axes. The reference (station 0) for all structural measurements in the X-axis are installed FWD of the A/C nose. These are the major A/C reference axes.

The aircraft reference axes are described in the AMM Chapter 06.

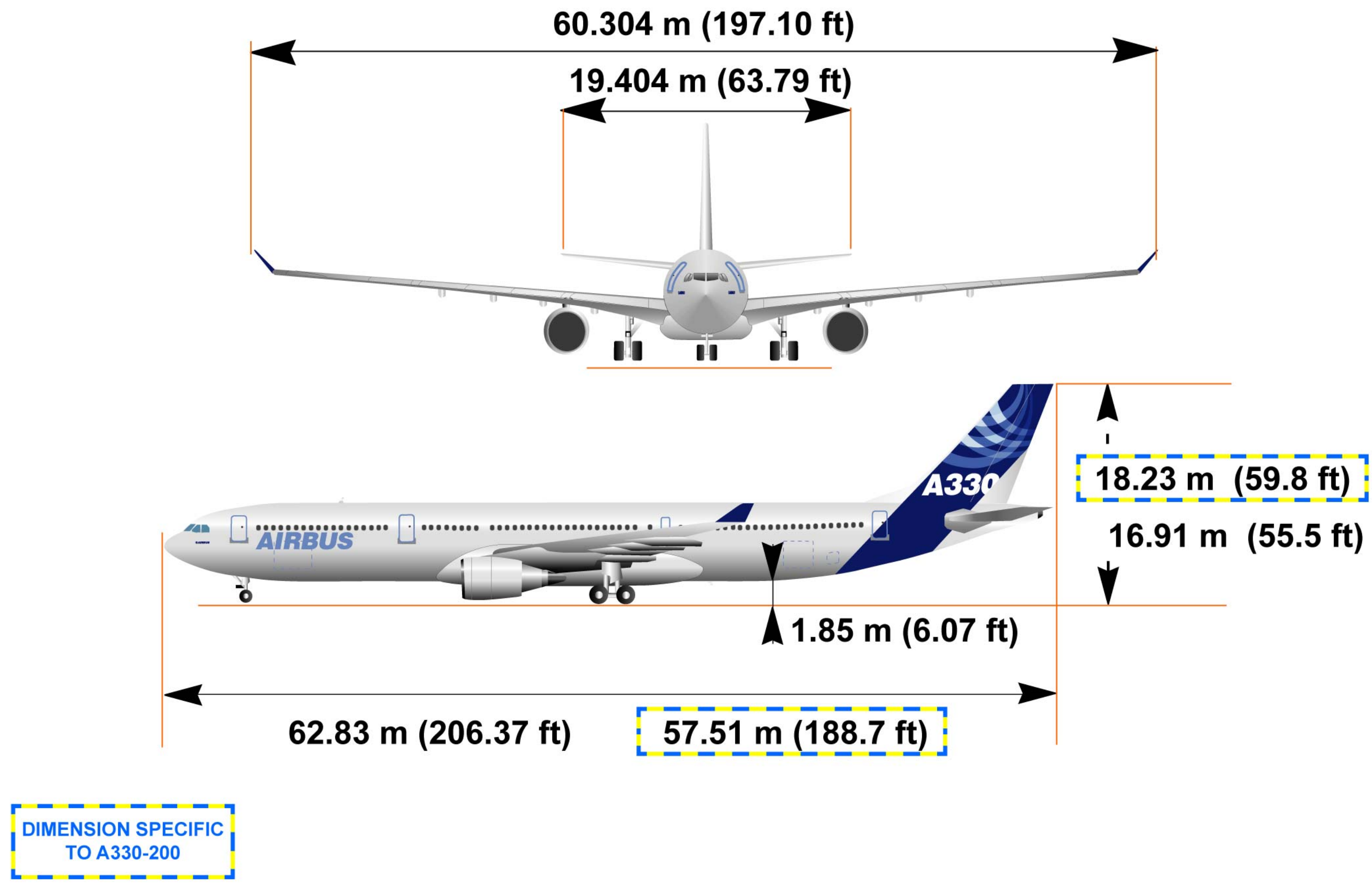


REFERENCE AXES

00 ZONE AND STATION PRESENTATION (1)

A/C DIMENSIONS

The dimensions are quoted in meters, in feet and in inches. Those dimensions measured from the static ground line are related to the A/C maximum weight.

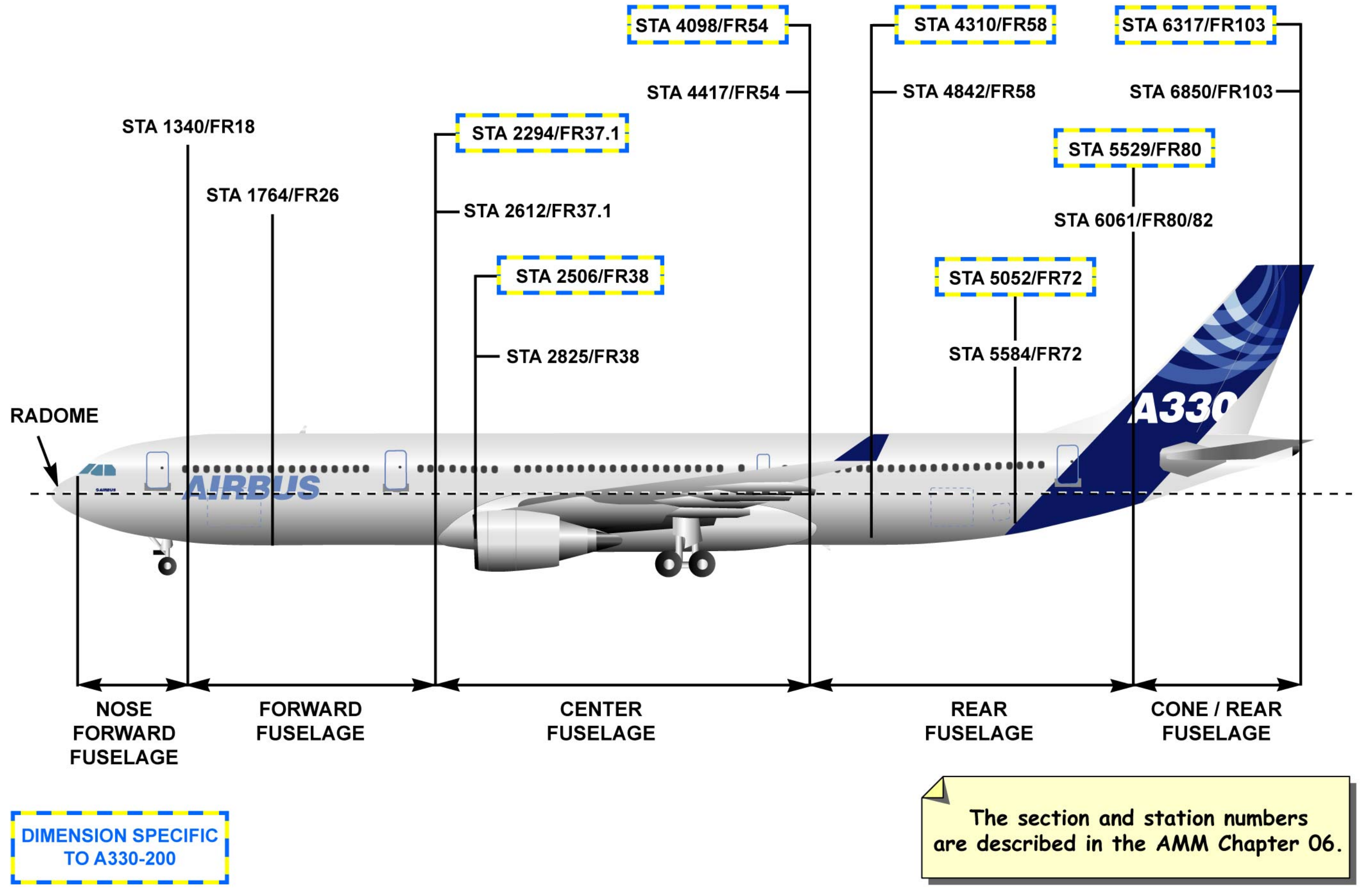


A/C DIMENSIONS

00 ZONE AND STATION PRESENTATION (1)

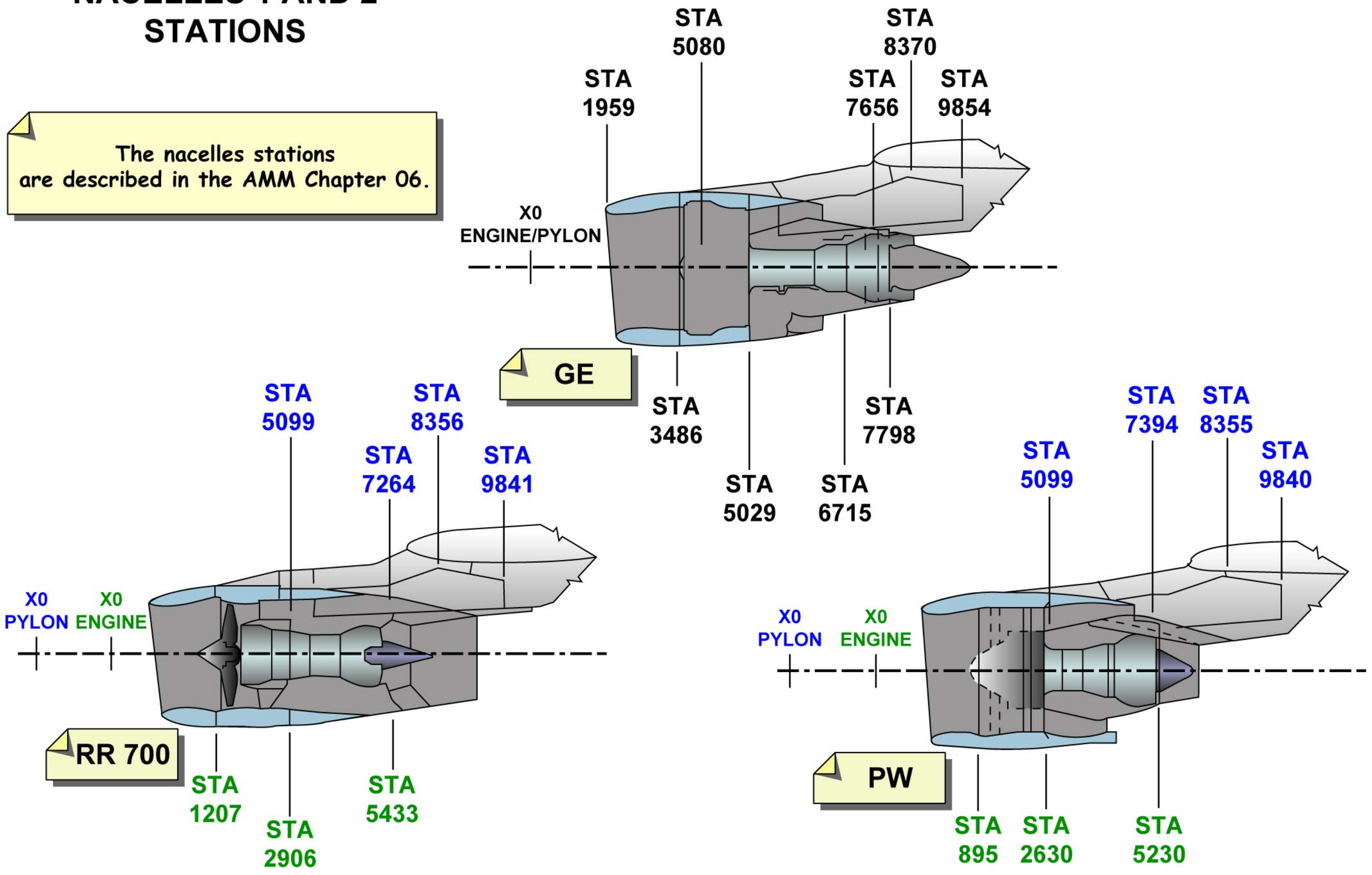
SECTION AND STATION NUMBERS

Each major part of the A/C, related to the production sharing, receives a section number. Here the fuselage sections are shown. The station number is the distance in centimeters of a cross section from a reference point.
Here are the fuselage station numbers, which are the section boundaries.
Here are the station numbers for the major areas of the A/C (the nacelles 1 and 2 stations).
Here are the station and rib numbers for the horizontal stabilizer.
Here are the station and rib numbers for the wing.
Here are the station and rib numbers for the vertical stabilizer.



SECTION AND STATION NUMBERS

NACELLES 1 AND 2 STATIONS



SECTION AND STATION NUMBERS

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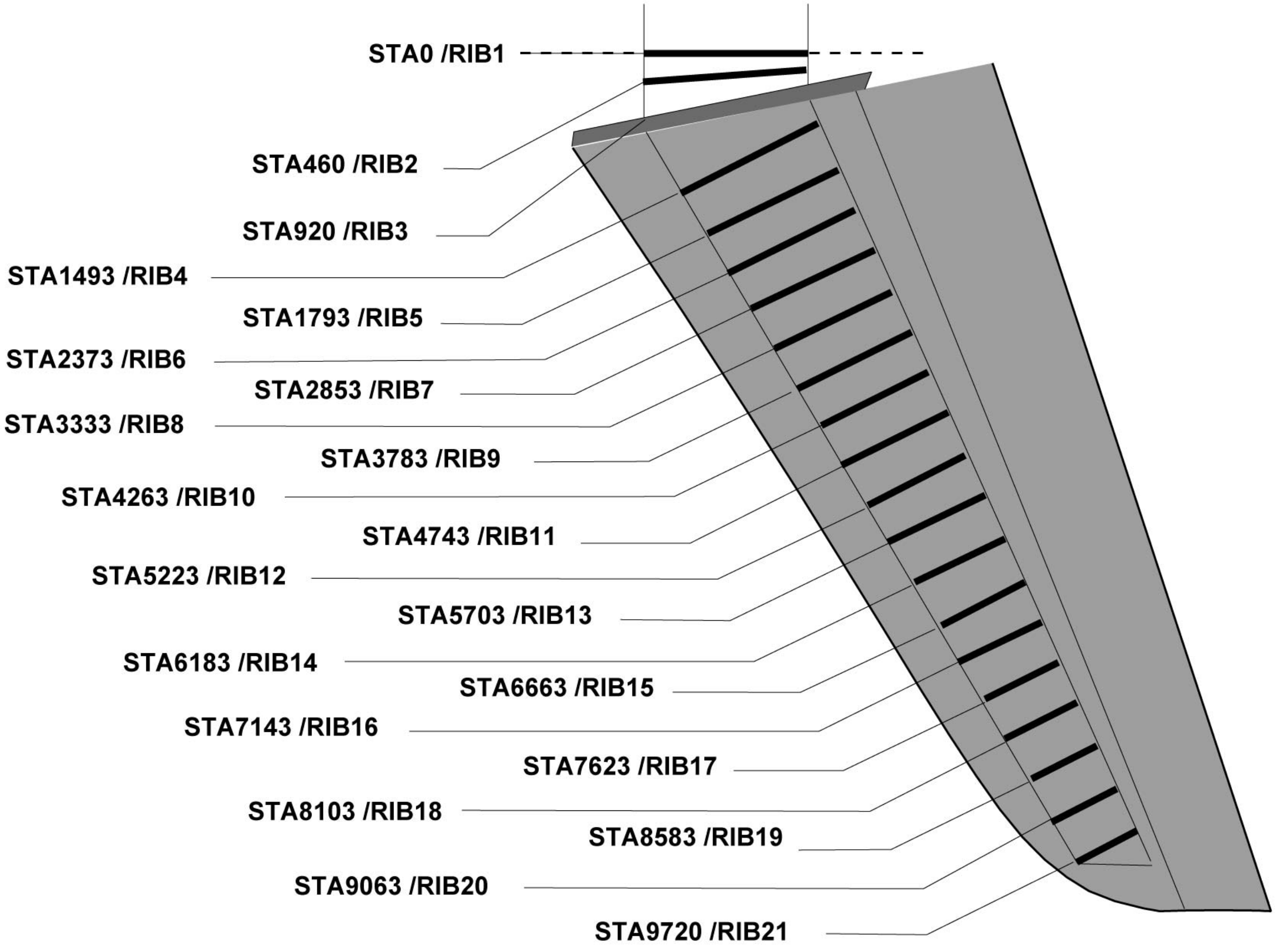

SECTION AND STATION NUMBERS

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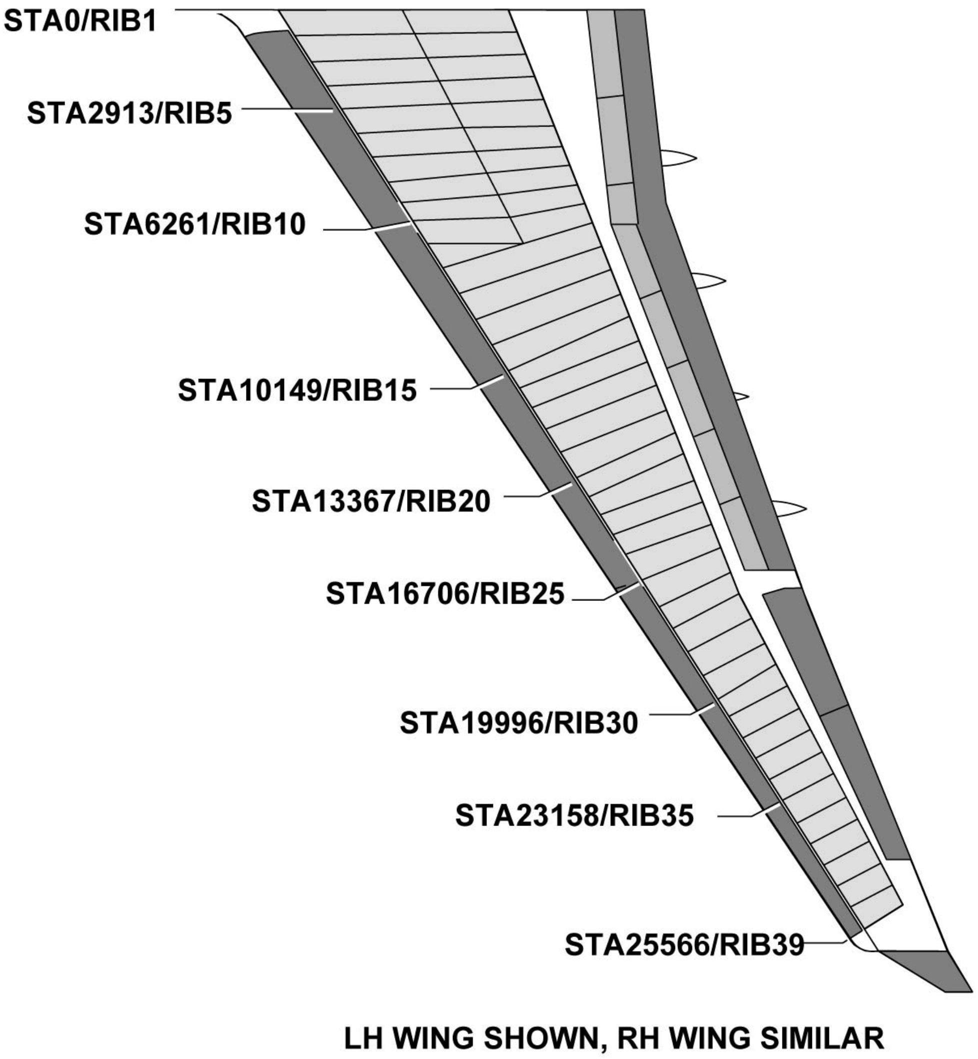

SECTION AND STATION NUMBERS

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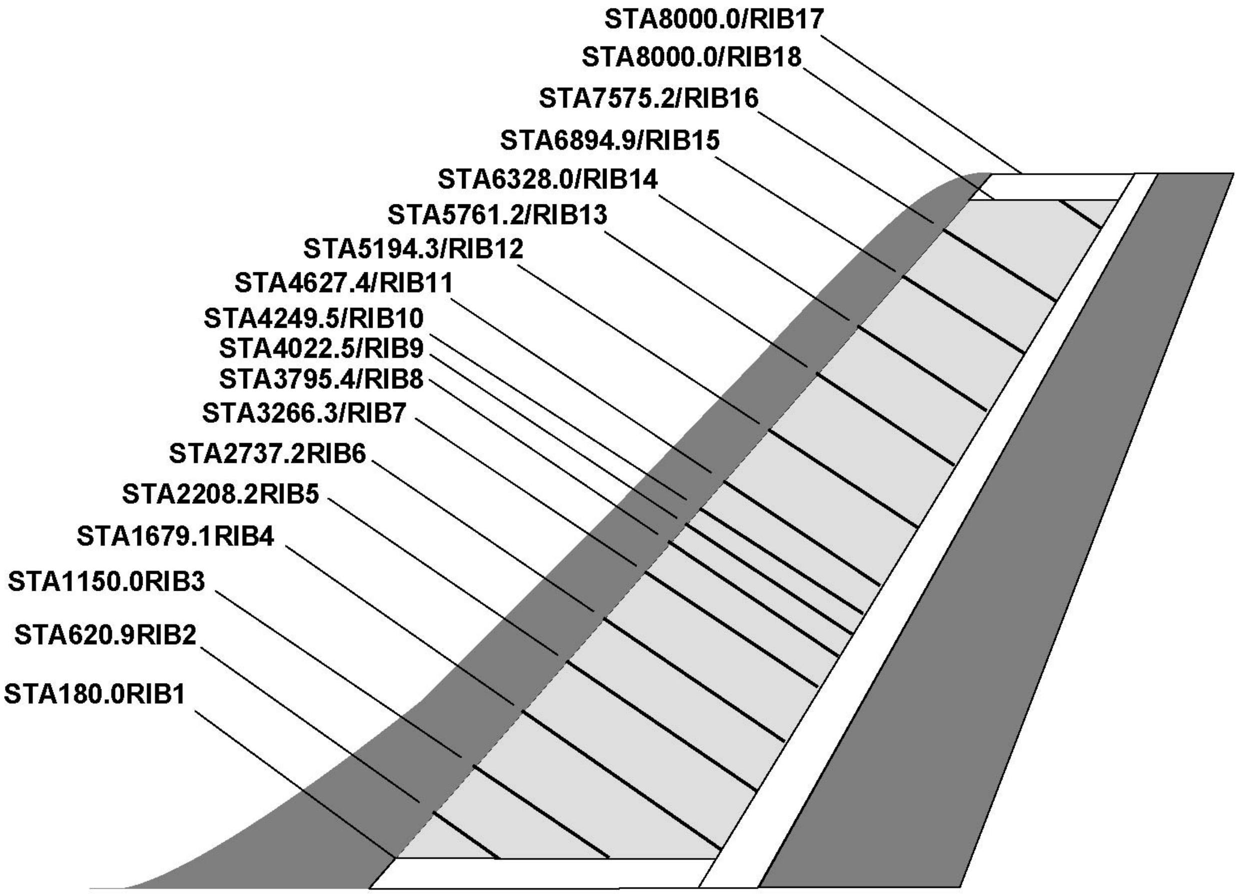


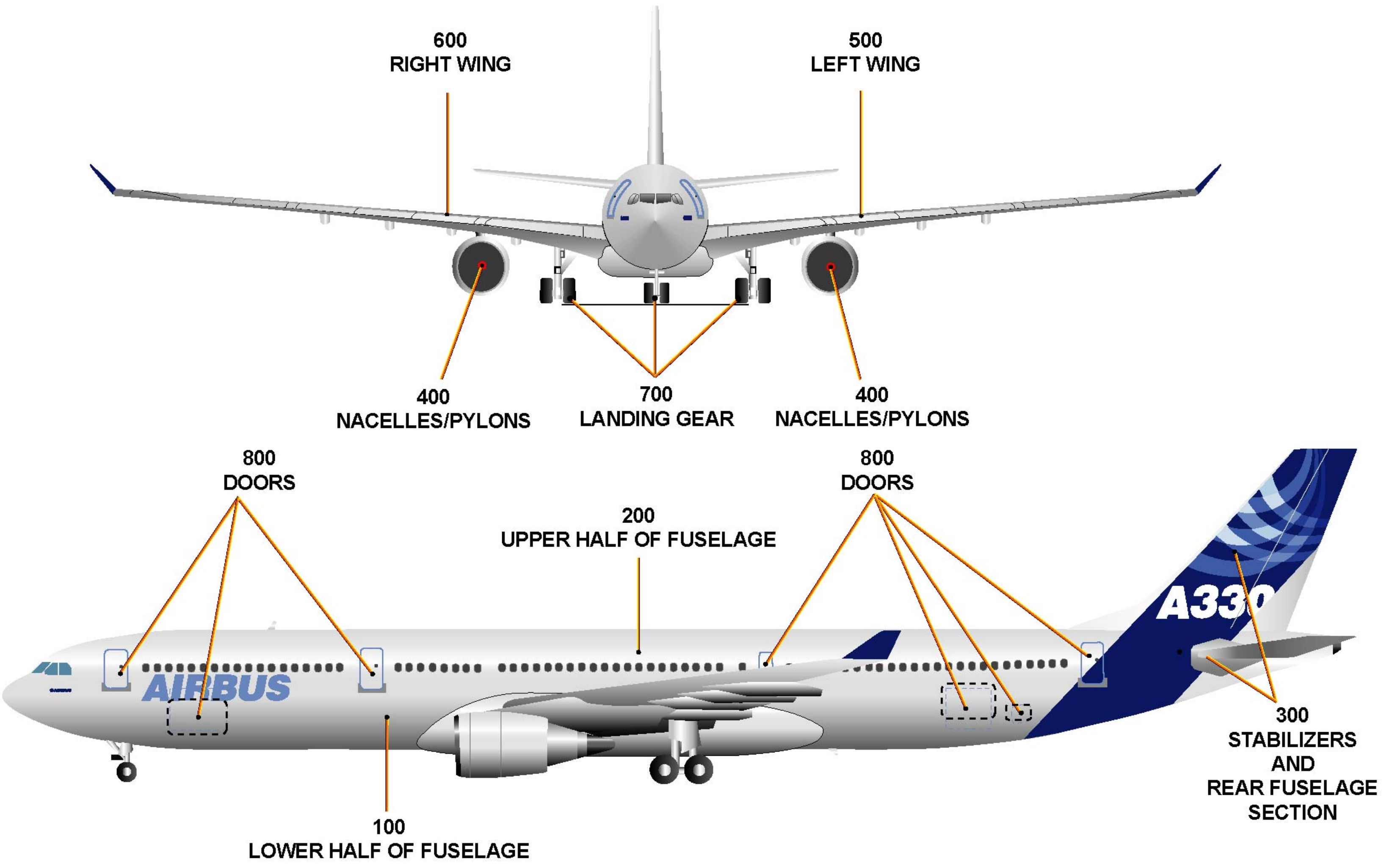
SECTION AND STATION NUMBERS

00 ZONE AND STATION PRESENTATION (1)

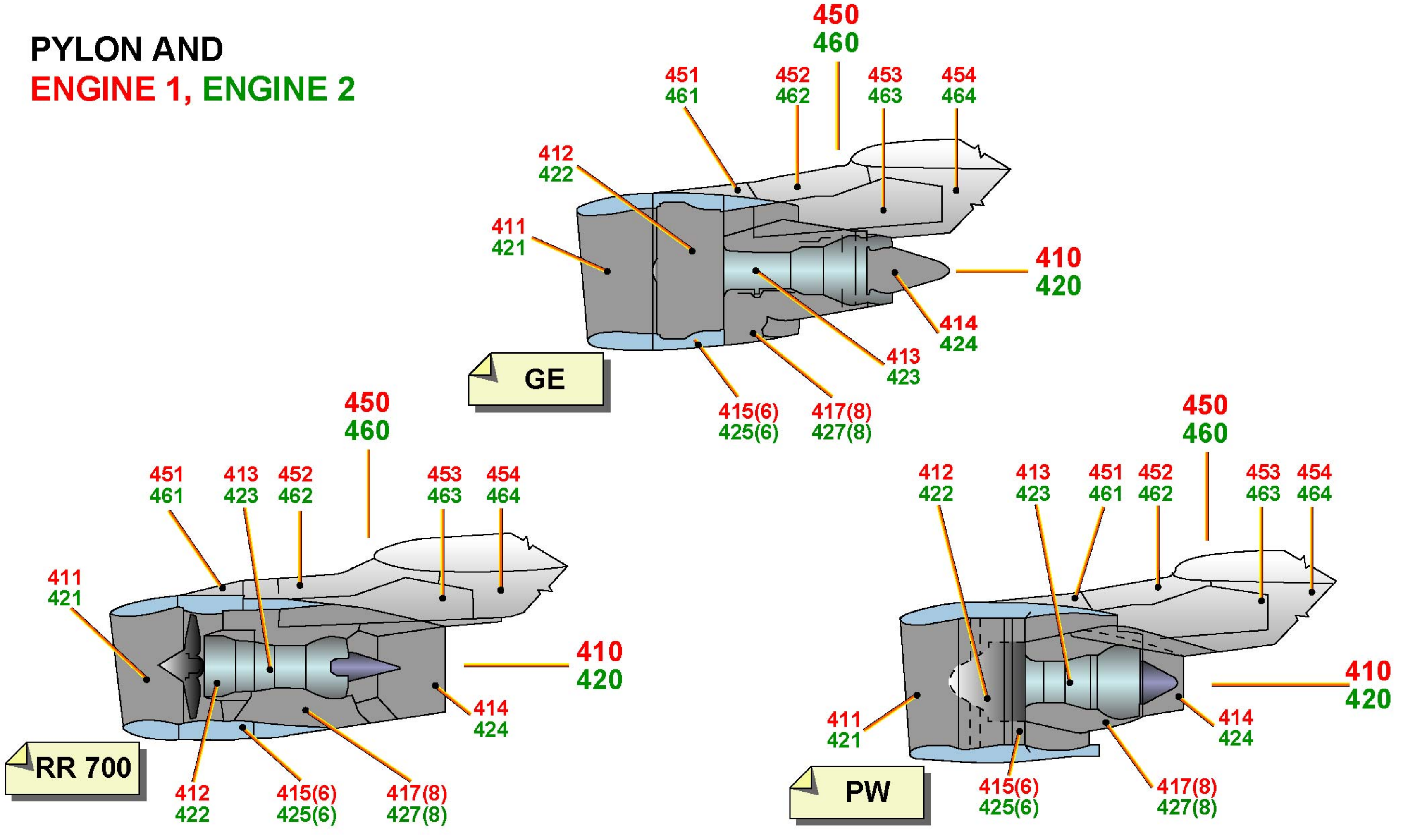
ZONE PRESENTATION

The A/C is divided into zones in order to make easy the maintenance and the component location. Each area is identified by major zones (hundreds).
The A/C is divided into 8 major zones:
- 100: Lower Fuselage,
- 200: Upper Fuselage,
- 300: Stabilizers,
- 400: Nacelles/Pylons,
- 500: Left Wing,
- 600: Right Wing,
- 700: Landing Gear,
- 800: Doors.

ATA 05 of the AMM lists the zonal inspection requirements for the A/C.
The major zones are divided into sub-zones, which are further divided into zones. An example of the engines zoning is shown in the diagram.



ZONE PRESENTATION



ZONE PRESENTATION

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00 ZONE AND STATION PRESENTATION (1)

ACCESS PANELS

An identification is given to the items below:
- access doors for the maintenance,
- service doors,
- fillets,
- fairings,
- removable access panels of the radio rack,
- removable floor panels,
- removable partition panels,
- removable ceiling panels,
- removable sidewall panels.

NOTE: Electrical panels are not included here since a special rule applies to them.

The first three digits identify the smallest zone in which the door/panel is found.
The first letter or identifier shows the position of the access doors and panels in a logical sequence:
- forward to aft, for the fuselage,
- inboard to outboard, for the wing and horizontal stabilizer,
- bottom to top, for the vertical stabilizer.

The second letter or locator identifies the access door or panel in its relation to the aircraft::
T = TOP (upper surface),
B = Bottom (lower surface),
L = Left hand,
R = Right hand,
Z = Internal,
F = Floor panel,
W = Sidewall panel,
C = Ceiling panel.

When all the letters of the alphabet have been used up for the first letter (identifier), the sequence starts again with letter A and the other letters below are used for the locator:
U = Top (upper surface),
D = Bottom (lower surface),
P = Left hand,
S = Right hand,
G = Floor panel,
X = Sidewall panel,
Y = Ceiling panel.

NOTE: The letters I and O are not used.

Special Identification Rules:
Passenger/crew doors, cargo doors, landing gear doors : only the zone number is used since each is a zone in itself.
Blow-out doors and vents have no identification number.
Access doors and panels in the fuselage centerline have the identification of the LH zone.
Similar doors on opposite sides of the aircraft have the same letter identifier even though zone numbers will be different.
A door on a zone limit is identified with the number of the zone from which it is removed.
If an access door or panel is in more than one zone, the lowest zone number applicable is used.

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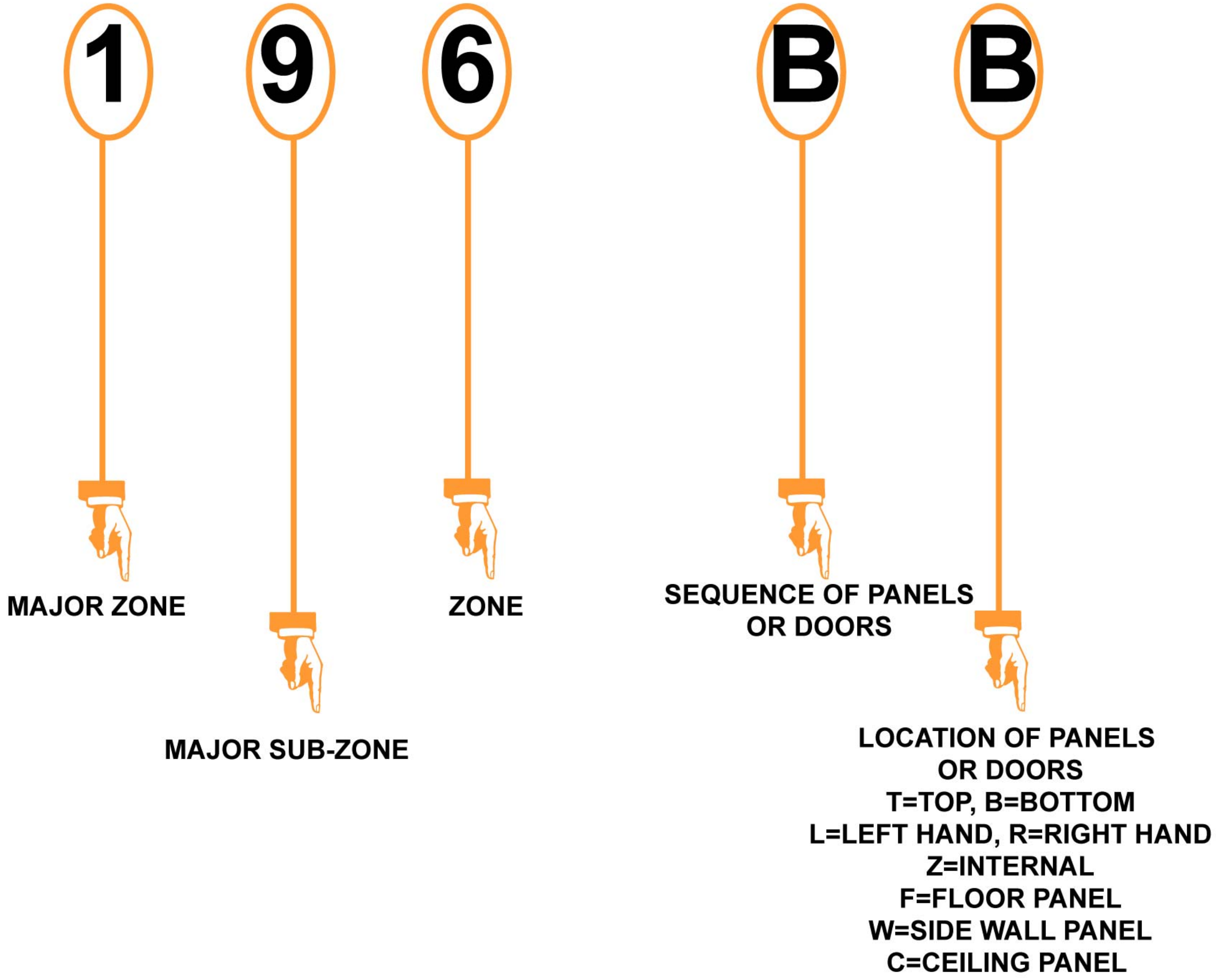

ACCESS PANELS

00 A/C HANDLING (1)

MAXIMUM TAKEOFF WEIGHT

The chart shows the Maximum Takeoff Weight (MTOW) for Long Range family aircraft.

MODEL	MTOW (KGS)	MTOW (LBS)
A330-200	192000 TO 233000	423285 TO 513675
A330-300	184000 TO 233000	405650 TO 513675
A340-300	253500 TO 275000	558866 TO 606270
A340-500	368000 TO 372000	811300 TO 845047
A340-600	365000 TO 368000	804686 TO 811300
A340-600	368000 TO 380000	811300 TO 837757

OPTION

MAXIMUM TAKEOFF WEIGHT

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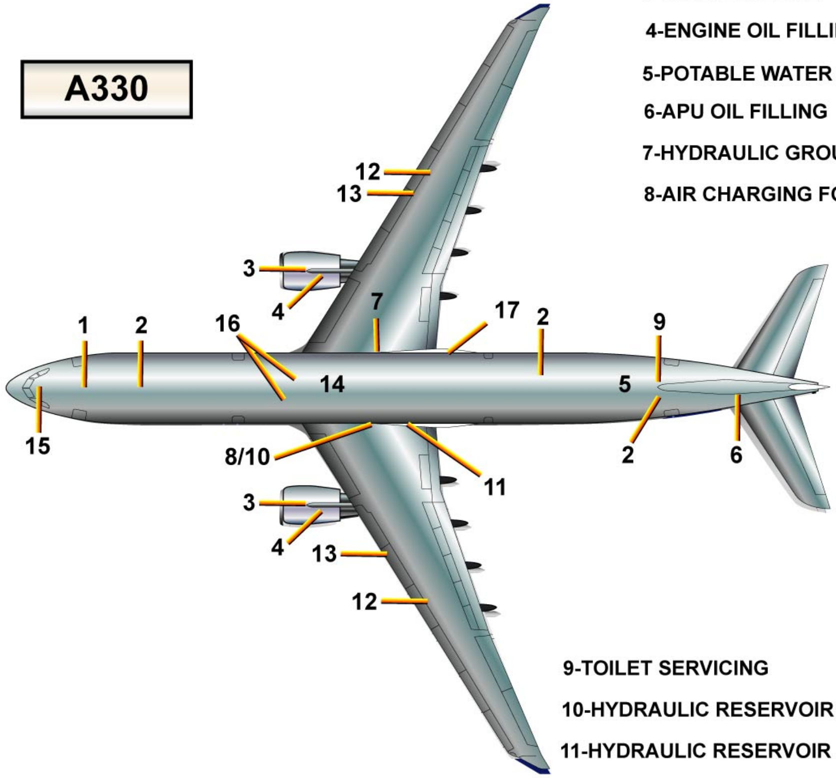
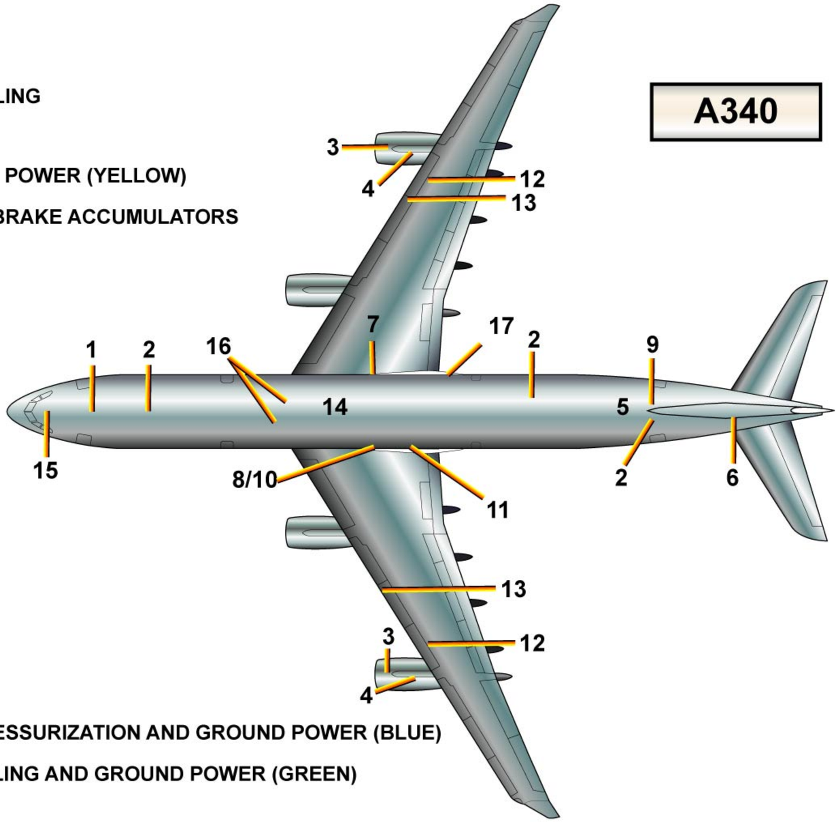
00 A/C HANDLING (1)

SERVICE POINTS

The picture shows the different service points for the A330 and the A340.

SERVICE POINTS





1-ELECTRICAL GROUND POWER
2-REMOTE WATER DRAIN
3-IDG OIL FILLING
4-ENGINE OIL FILLING
5-POTABLE WATER FILLING
6-APU OIL FILLING
7-HYDRAULIC GROUND POWER (YELLOW)
8-AIR CHARGING FOR BRAKE ACCUMULATORS
9-TOILET SERVICING
10-HYDRAULIC RESERVOIR PRESSURIZATION AND GROUND POWER (BLUE)
11-HYDRAULIC RESERVOIR FILLING AND GROUND POWER (GREEN)
12-FUEL GRAVITY FILLING
13-FUEL PRESSURE FILLING
14-HIGH PRESSURE AIR CONDITIONING AND ENGINE STARTING
15-OXYGEN SYSTEM
16-LOW PRESSURE PRE-CONDITIONING
17-REFUEL/DEFUEL PANEL

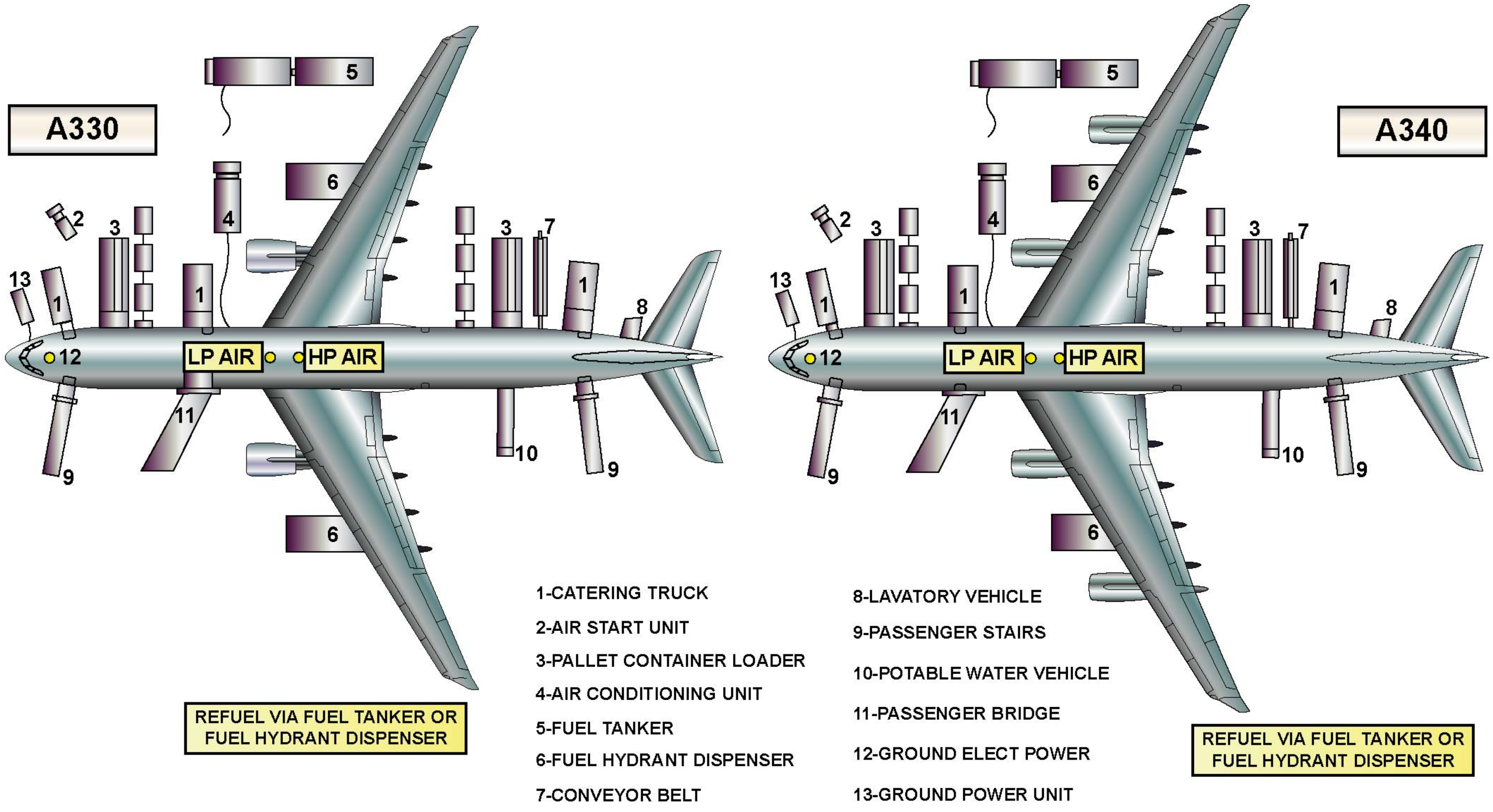
SERVICE POINTS

00 A/C HANDLING (1)

SERVICE ARRANGEMENTS

The positioning of some items may vary with local arrangements. The picture shows the different service arrangements for the A330 and the A340.

SERVICE ARRANGEMENTS



SERVICE ARRANGEMENTS

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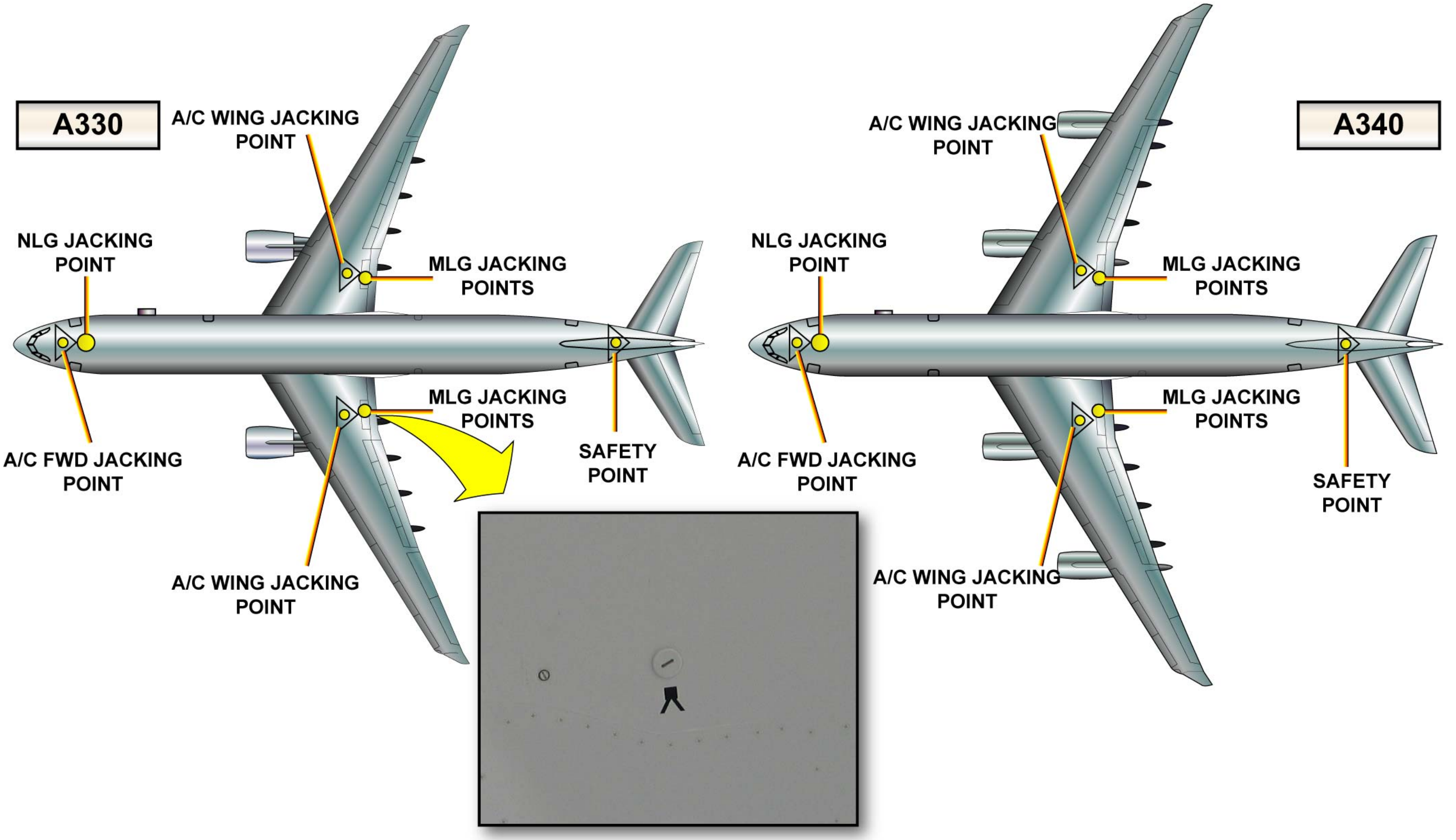
00 A/C HANDLING (1)

JACKING

The three jacks have to be operated together. As soon as the jacking operation is finished, position the tail safety stay to stabilize the aircraft.
The three jacking points, when equipped with jacking pads, are used to lift the aircraft. The forward jacking point is located forward of the Nose Landing Gear (NLG). The wing jacking points are located outboard of the Main Landing Gear (MLG). You can lift the aircraft at the forward jacking point only, with the main wheels on the ground. A tail safety stay can be positioned at the rear of the aircraft after jacking to stabilize the aircraft.
The landing gear has jacking points:
- 2 jacking points located on each MLG,
- 1 jacking point located on the NLG.

The open air jacking operation is limited if the wind velocity exceeds permissible values which depend on aircraft gross weight and center of gravity position. In any condition, the aircraft must be pointing upwind.

JACKING POINTS



JACKING

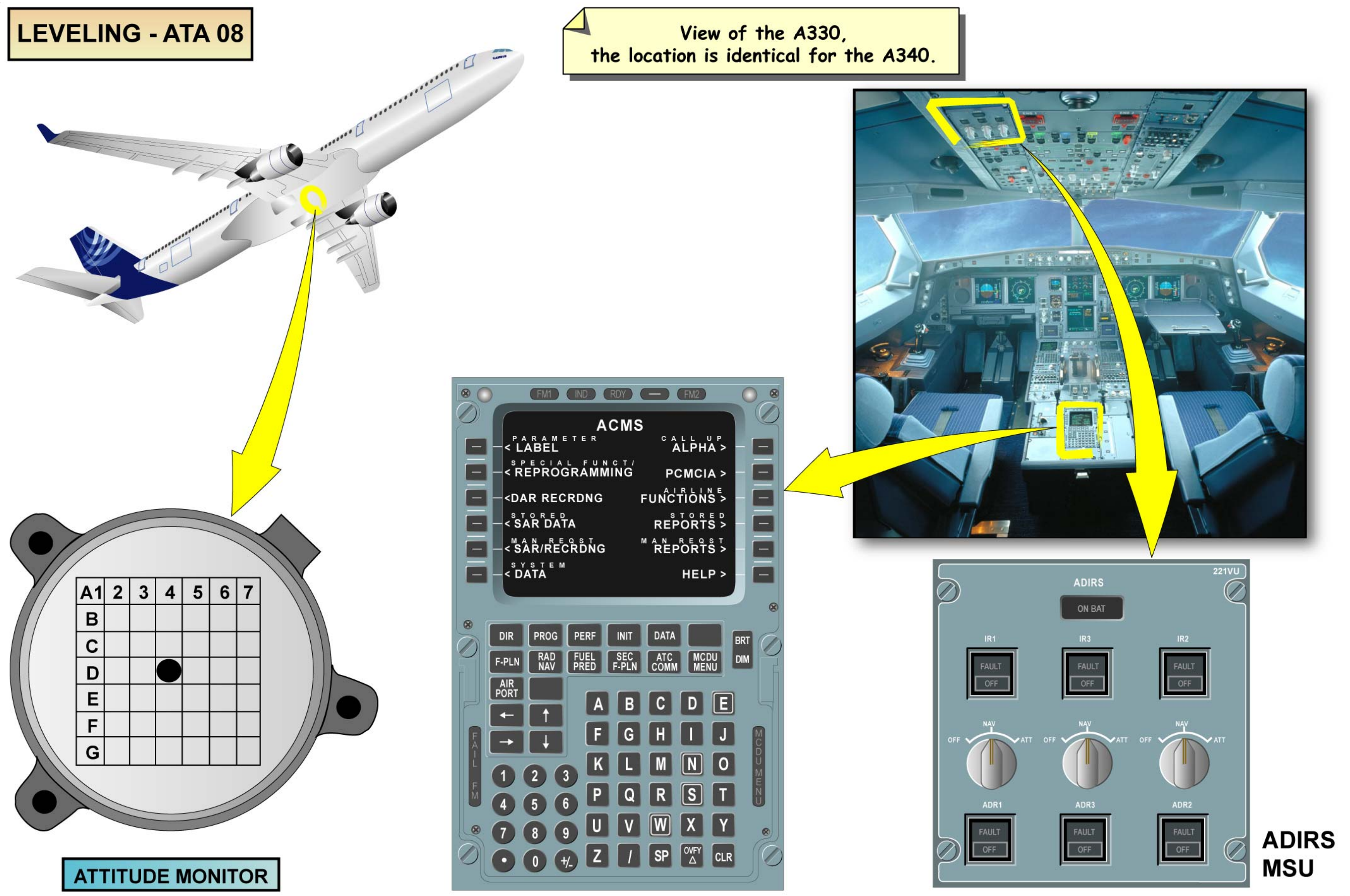
00 A/C HANDLING (1)

LEVELING AND WEIGHING

Different methods of leveling and weighing of the aircraft are possible.

QUICK LEVELING

There are two main procedures to level the aircraft:
- quick leveling with Air Data/Inertial Reference System (ADIRS),
- quick leveling with the attitude monitor, located in the belly fairing.



LEVELING AND WEIGHING - QUICK LEVELING

00 A/C HANDLING (1)

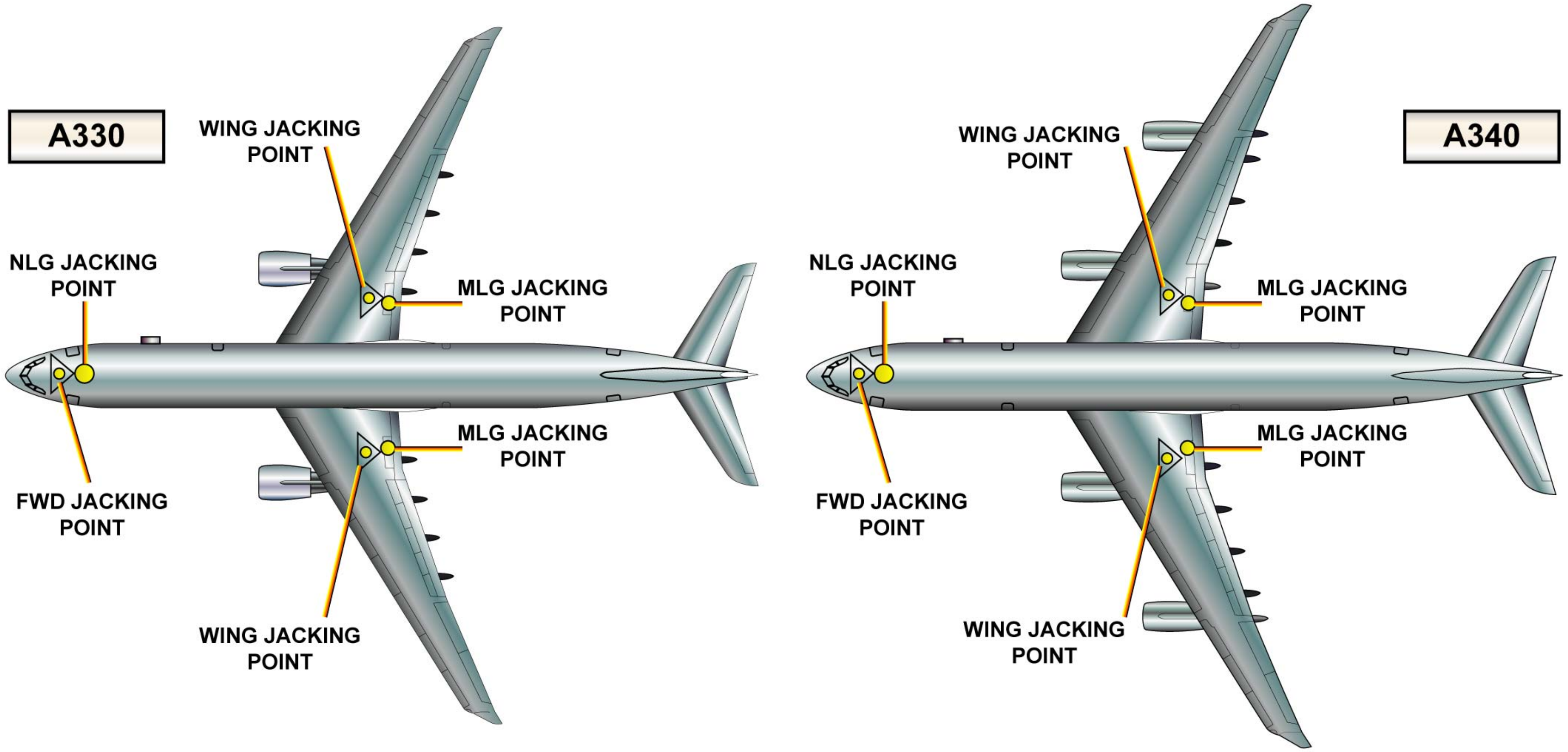
LEVELING AND WEIGHING (continued)

WEIGHING

You can weigh the aircraft with:
- the aircraft on jacks,
- the aircraft on its wheels,
- the aircraft on landing gear jacks.

Load cells on each jack or platform scales are used for weighing.

WEIGHING - ATA 08



LEVELING AND WEIGHING - WEIGHING

00 A/C HANDLING (1)

TOWING AND TAXIING

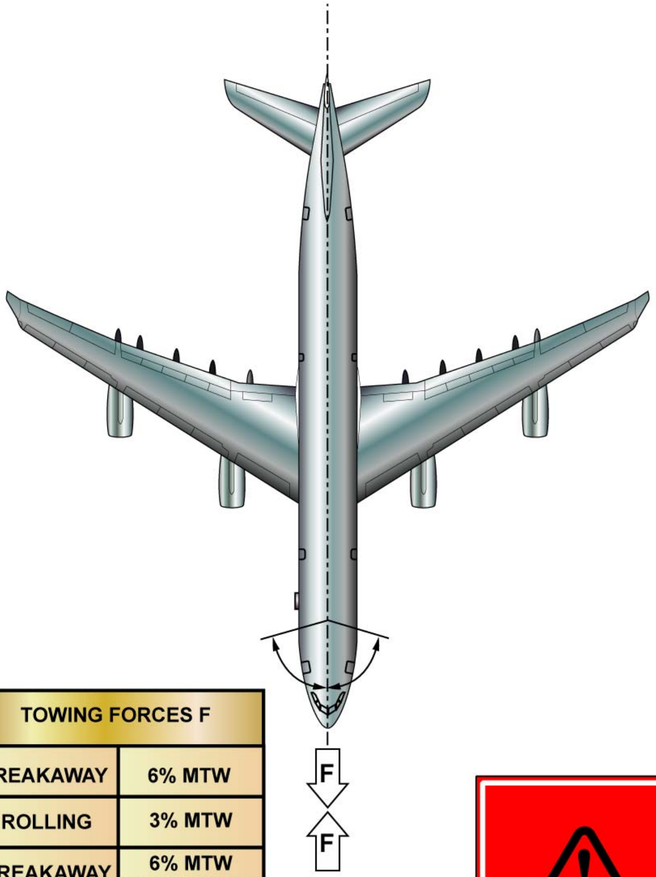
This topic gives information related to the towing and taxiing of the aircraft.
Make sure that each person in the aircraft is in a seat and the seat belt is fastened during towing and taxiing operations (low-speed operations included).

TOWING

Before towing the aircraft:
- make sure that the safety devices are installed on the landing gears,
- make sure that the dimension 'H' of the Nose Landing Gear (NLG) is never greater than 310 mm (407 mm for A340-600),
- on the nose wheel steering deactivation electrical box, set the ground towing control lever to the towing position and install the pin.

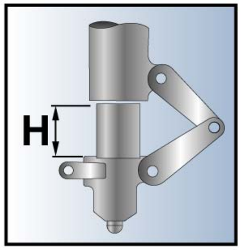
NOTE: Towing the aircraft is possible either with the NLG front device or the NLG aft device.

TOWING WITH THE NOSE LANDING GEAR - ATA 09

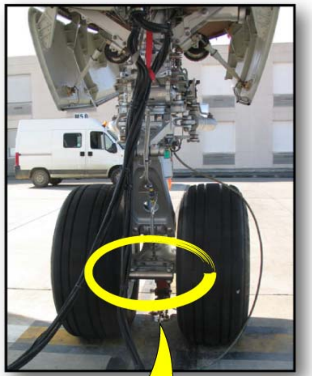


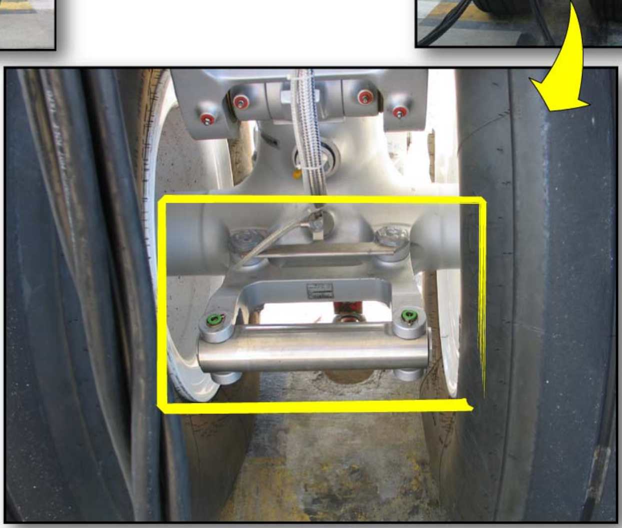
TOWING FORCES F	
BREAKAWAY	6% MTW
ROLLING	3% MTW
BREAKAWAY ON SLOPE	6% MTW +1% MTW PER 1% SLOPE
ROLLING ON SLOPE	3% MTW +1% MTW PER 1% SLOPE

NLG FRONT VIEW



NLG REAR VIEW





TOWING DEVICE

WARNING

EACH PERSON IN THE AIRCRAFT IS IN A SEAT AND SEAT BELTS ARE FASTENED DURING TOWING AND TAXIING OPERATIONS (LOW-SPEED OPERATIONS INCLUDED).

TOWING AND TAXIING - TOWING

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00 A/C HANDLING (1)

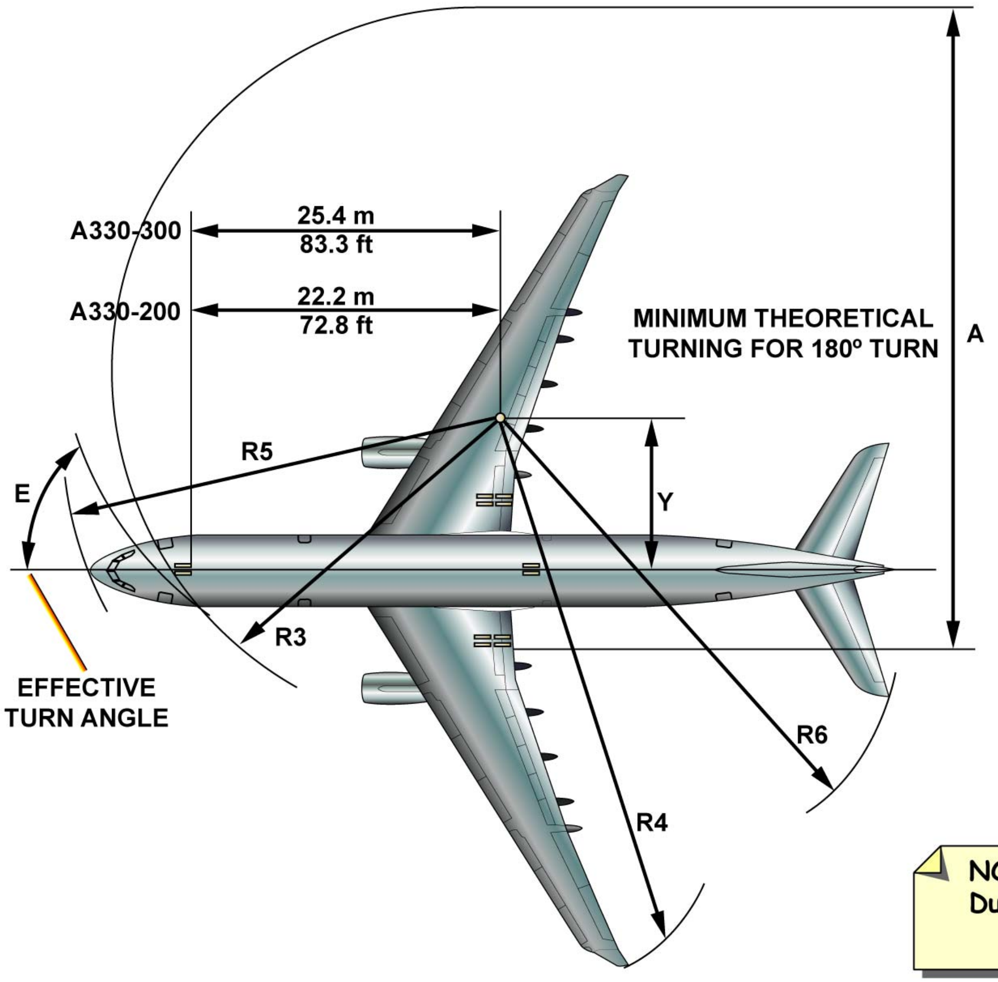
TOWING AND TAXIING (continued)

TAXIING

When the aircraft moves with its power on the ground, the AMM safety precautions must be taken into account.

- Dangerous engine areas: Safety precautions must be taken to avoid danger from engine suction and exhaust areas.
- Depending on the distance from the running engine and on its power setting, it is necessary to wear ear protection and to respect the maximum time exposure.

A330 MINIMUM TURNING RADIUS - ATA 09



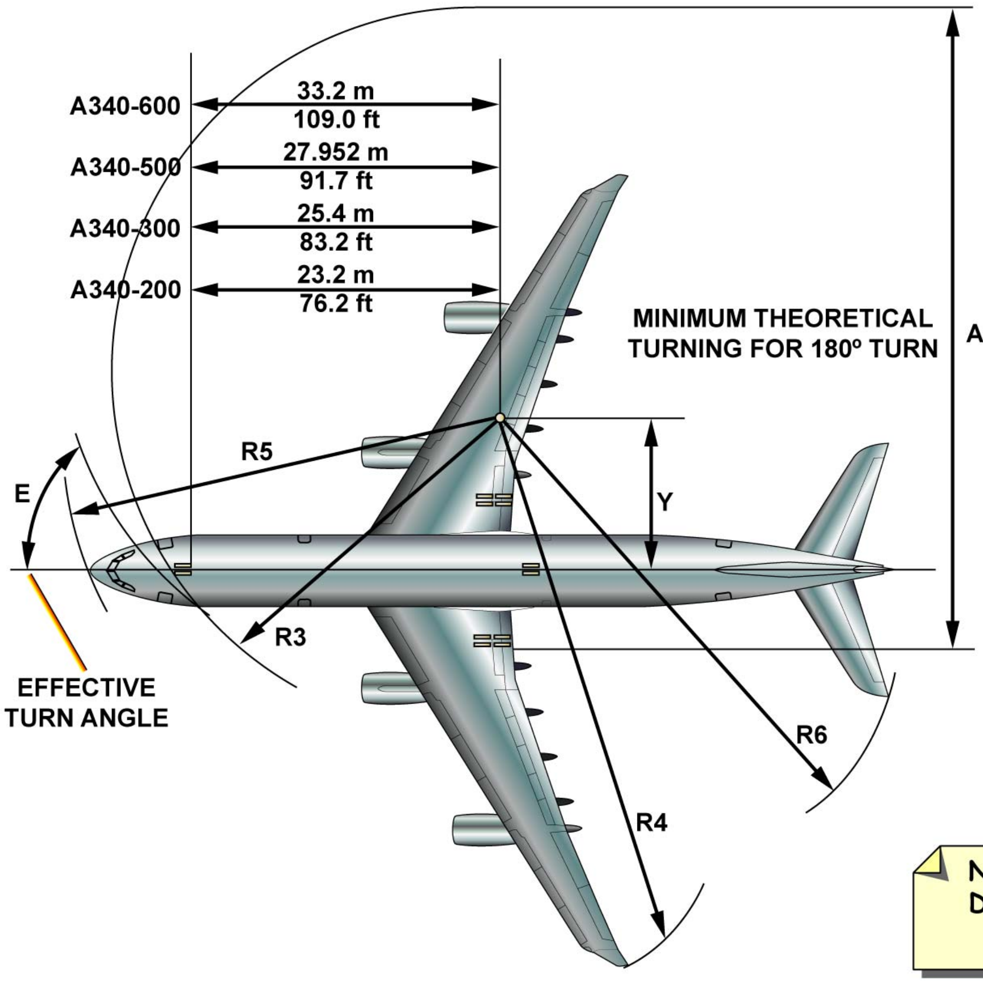
A330-200	TURN
E	62.3º
Y	38.2 ft 11.6 m
A	143 ft 43.6 m
R3	84.1 ft 25.6 m
R4	141.1 ft 43 m
R5	102.4 ft 31.2 m
R6	119.6 ft 36.4 m

A330-300	TURN
E	60.5º
Y	46.8 ft 14.3 m
A	158.9 ft 48.4 m
R3	97.3 ft 29.7 m
R4	149.4 ft 45.6 m
R5	115.4 ft 35.2 m
R6	130.3 ft 39.7 m

NOTE:
During turn: Apply symetric thrust, no braking input
Slow continous turning

TOWING AND TAXIING - TAXIING

A340-200/ A340-300/ A340-500/ A340-600 MINIMUM TURNING RADIUS - ATA 09



	A340 -200 TURN	A340 -300 TURN	A340 -500 TURN	A340 -600 TURN
E	61.5º	61.5º	65.2º	67.4º
Y	41.5 ft 12.7 m	44.4 ft 13.5 m	42.1 ft 12.8 m	45.1 ft 13.7 m
A	150.2 ft 45.8 m	162.4 ft 49.5 m	165.8 ft 50.5 m	185.9 ft 56.7 m
R3	89.3 ft 27.2 m	96.9 ft 29.6 m	102.9 ft 31.4 m	120.0 ft 36.6 m
R4	143.7 ft 43.7 m	147 ft 44.8 m	150.4 ft 45.9 m	153.4 ft 46.8 m
R5	106.8 ft 32.5 m	114.7 ft 34.9 m	120.8 ft 36.8 m	138.2 ft 42.1 m
R6	110.8 ft 33.8 m	128.4 ft 39.1 m	134.9 ft 41.4 m	143.1 ft 43.6 m

NOTE:
During turn: Apply symetric thrust, no braking input
Slow continous turning

TOWING AND TAXIING - TAXIING

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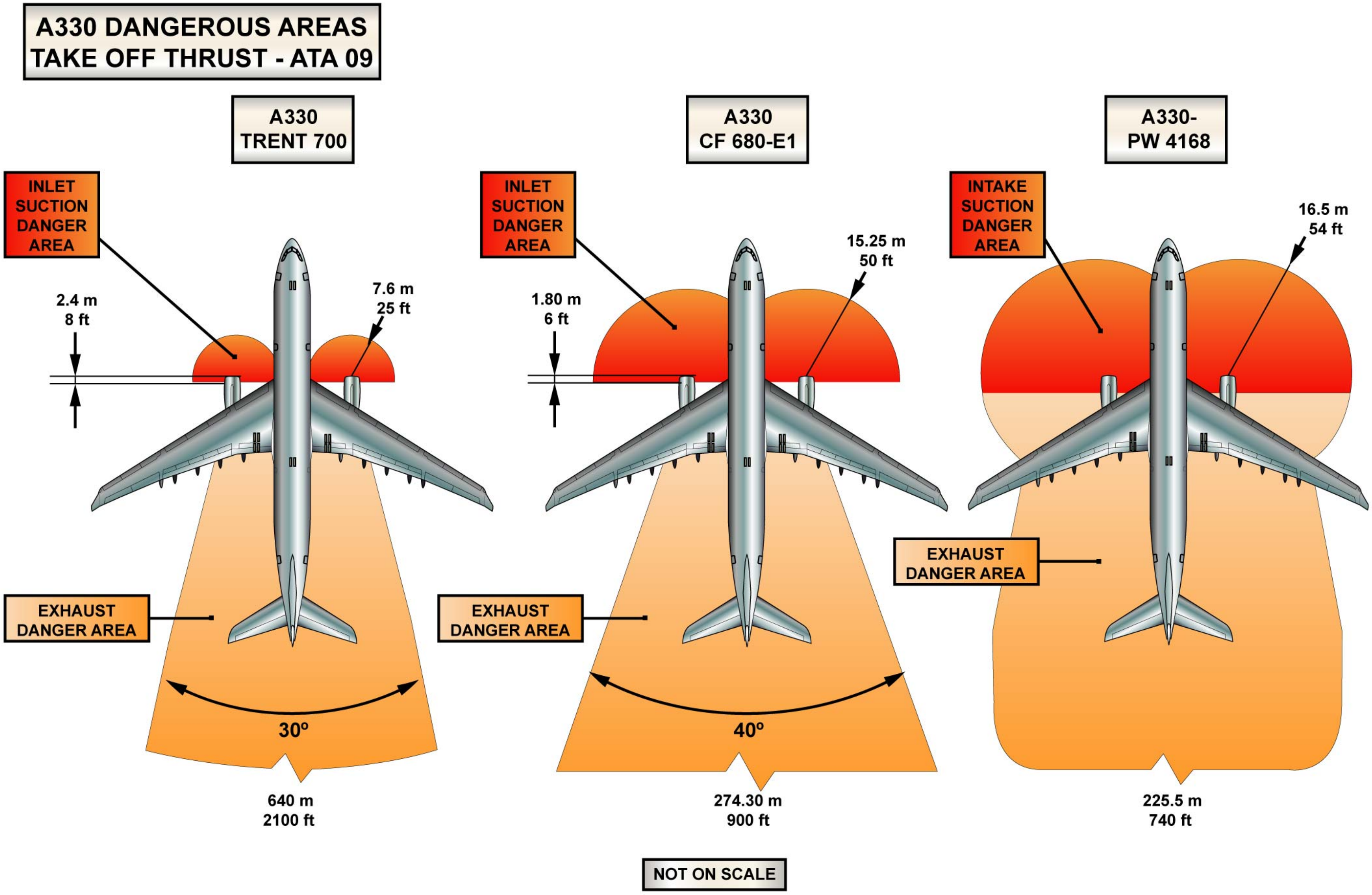
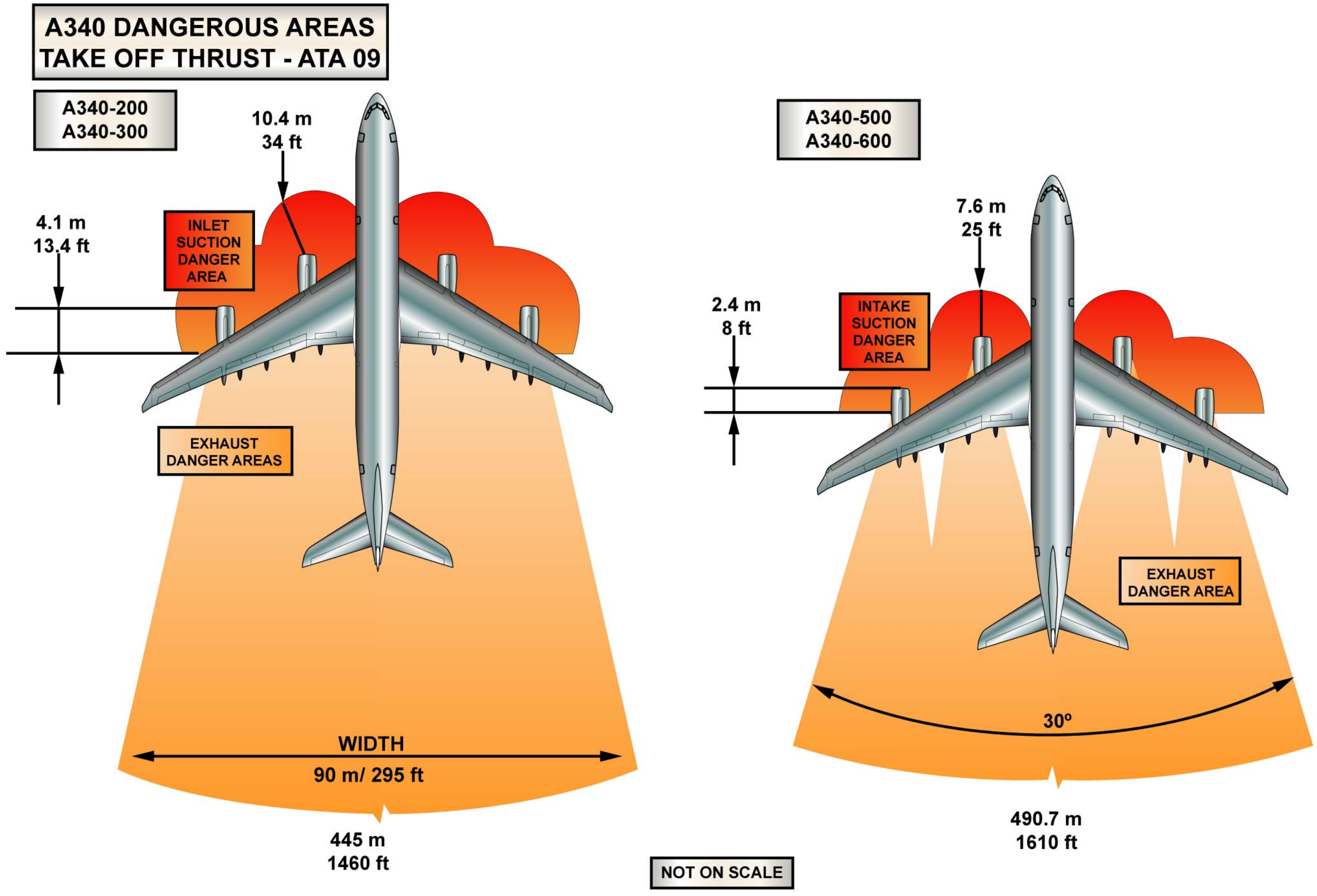
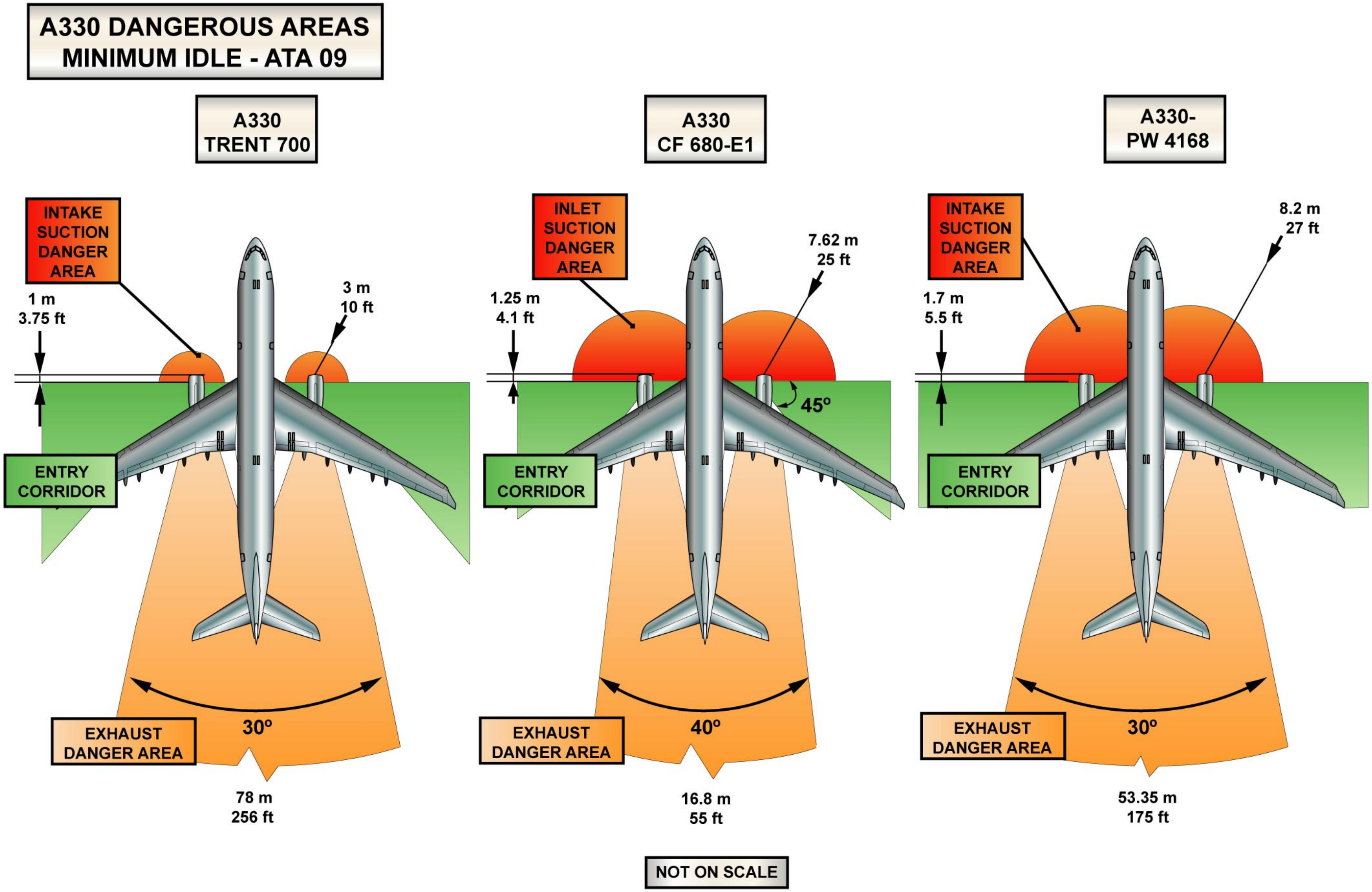


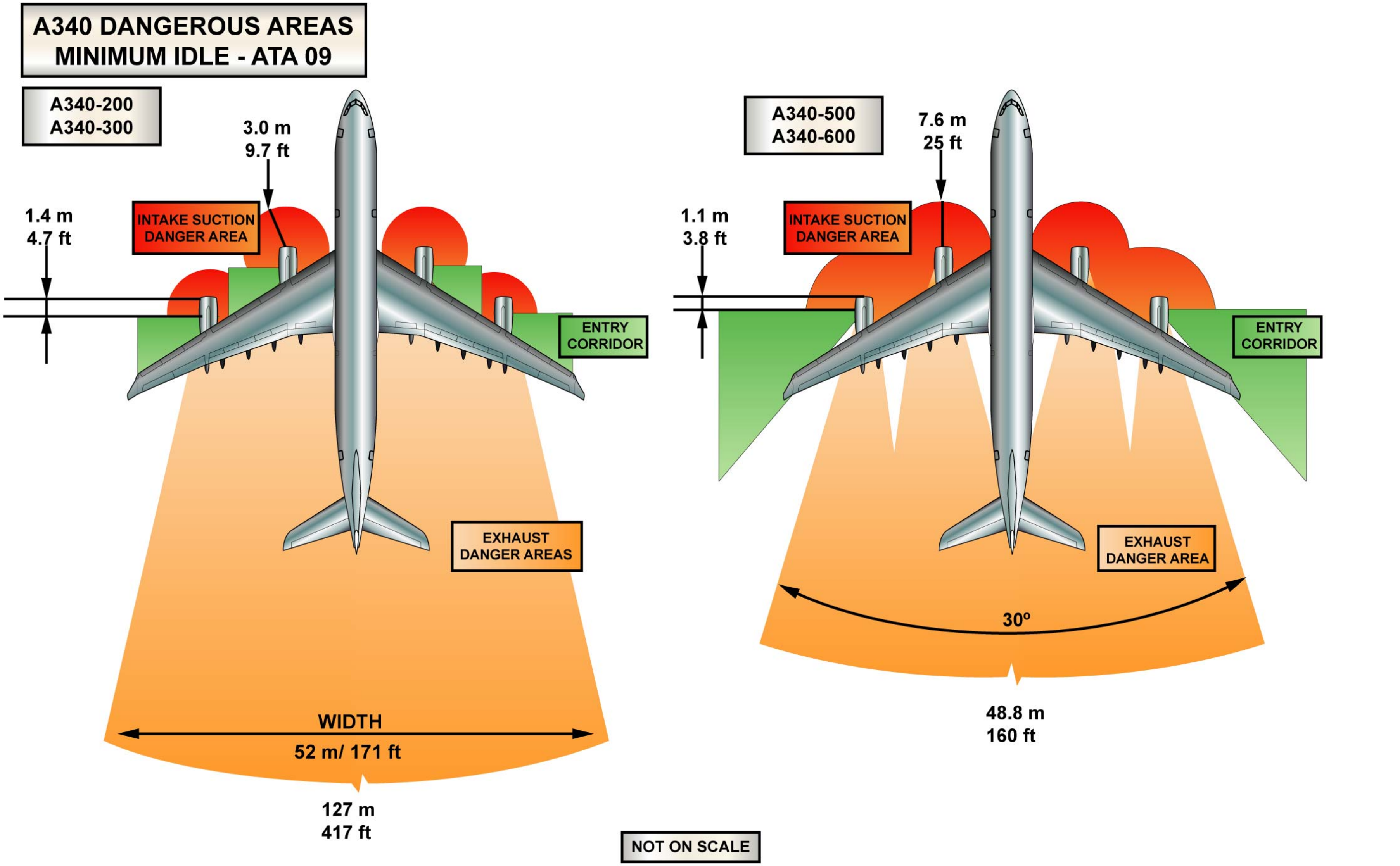
TOWING AND TAXIING - TAXIING



TOWING AND TAXIING - TAXIING



TOWING AND TAXIING - TAXIING



TOWING AND TAXIING - TAXIING

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00 A/C HANDLING (1)

PARKING AND MOORING

This topic covers the parking of the aircraft and the mooring of the landing gear.

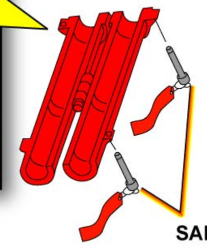
PARKING PROCEDURE

To park the aircraft follow these tasks:
- If necessary, do the cold weather procedure and clean the aircraft.
- Park the aircraft on a flat surface. Make sure that the wheels of the nose landing gear are on the aircraft axis and the aircraft points into the wind.
- Install the safety devices on the landing gears.
- Make sure that the flight control surfaces are retracted and THS at 2 degrees
- Put the wheel chocks in position:
- for the NLG, in front of and behind the wheels,
- for the MLG, in front of and behind wheels.
- Ground the aircraft.

If necessary refuel the fuel tanks to 30% minimum of their total capacity.
- Drain water from all the fuel tanks.
- Drain potable water and lavatories.
- Open the cockpit and cabin window shades. Make sure that the sliding windows are closed.
- Installation of the Protection Equipment: Protect all the probes, the engines and the APU with adapted protection equipment.
- On the overhead panel 225VU, on the CABIN PRESS section, push the DITCHING pushbutton switch.

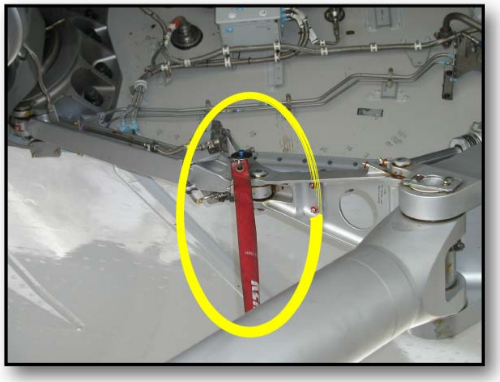
PARKING PROCEDURE - ATA 10

- In cold weather conditions, do the cold weather procedures.
- Clean the aircraft if necessary
- Park the aircraft on a flat surface
- Install the landing gears safety devices
- Flight control surfaces retracted
- THS set to two degrees up
- Put the wheel chocks in position
- Ground the aircraft
- Refuel tanks to a minimum of 30%
- Drain water from all fuel tanks
- Drain potable water and lavatories
- Open all window shades
- Close cockpit sliding windows
- Install protection equipment (probes, engines, APU)

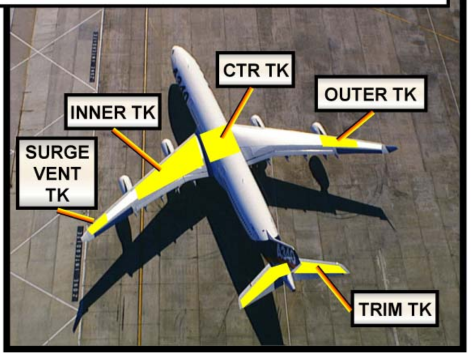


SAFETY COLLAR

SAFETY PINS



DRAIN WATER FROM ALL FUEL TANKS



AIRCRAFT MAINTENANCE CONFIGURATION:
- On the panel 225VU, push the ditching pushbutton switch
- De-energize the aircraft electrical circuits

PARKING AND MOORING - PARKING PROCEDURE

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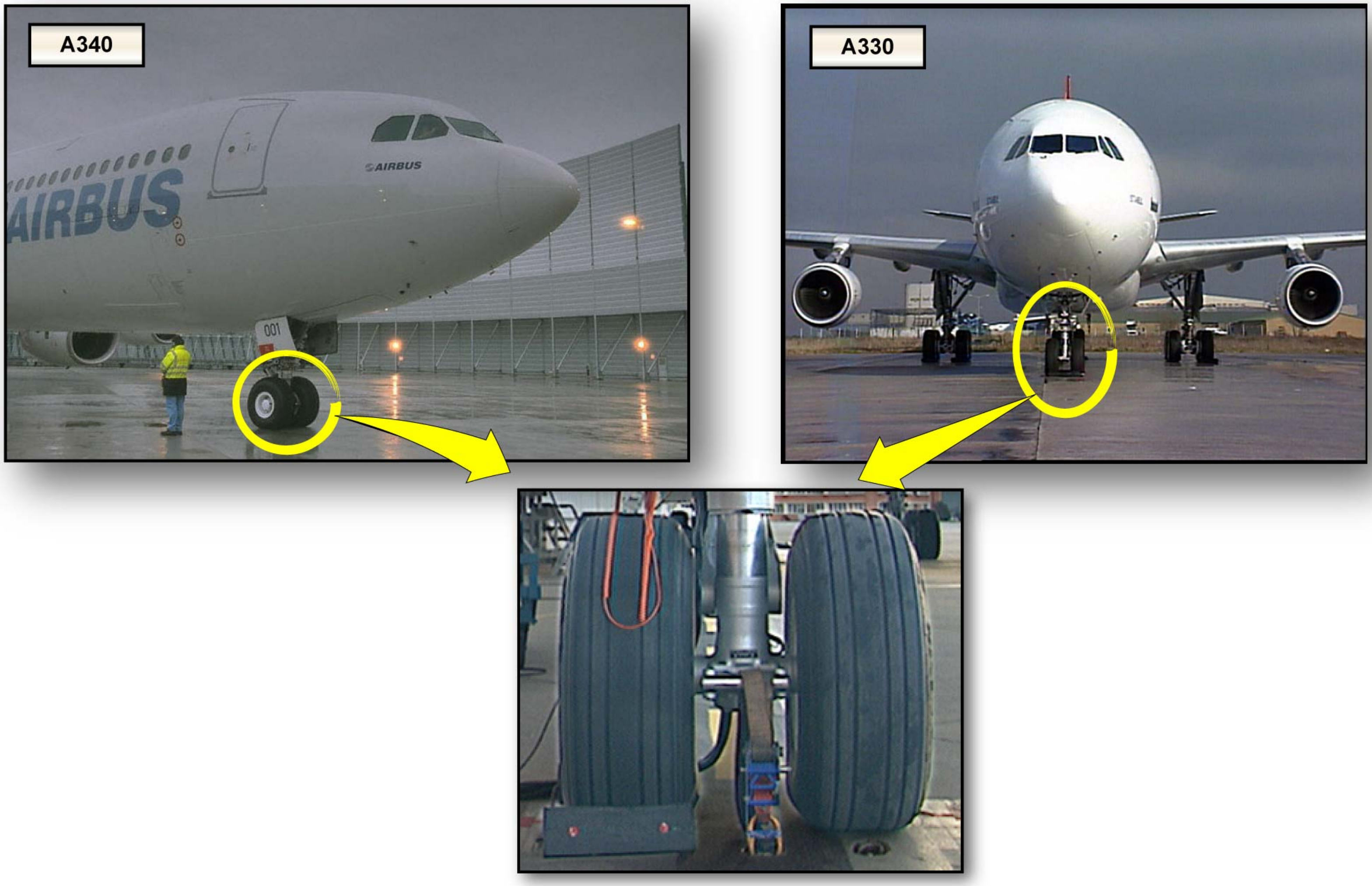
00 A/C HANDLING (1)

PARKING AND MOORING (continued)

MOORING

The function of mooring is to prevent movement of the aircraft in high winds. The limits of aircraft stability in relation to the wind speed are given in the Aircraft Maintenance Manual (AMM) chapter 05-57-00. Long Range aircraft are moored at the NLG. Make sure that the wheels of the NLG are on the aircraft axis and the aircraft points into the wind. Install wheel chocks in position for NLG and MLG.

AIRCRAFT MOORING - ATA 10



PARKING AND MOORING - MOORING

G6B08031 - G10T4T0 - FM01D1000000001

00 A/C HANDLING (1)

GROUND SUPPORT EQUIPMENT AND TOOLS

The World Airlines Technical Operations Glossary (WATOG) definition of Ground Support Equipment (GSE) is:
equipment required on the ground to support the operation and maintenance of the aircraft and all its airborne equipment.
Airbus divides GSE into two categories:
- tools,
- standard GSE.

Tools can be split into two categories:
- standard tools,
- specific tools.

STANDARD TOOLS

Standard tools are hand tools such as spanners, sockets, gauges, torque wrenches...
The specifications (size, range, capacity, accuracy...) are given in the related AMM task to let operators use the tool brand of their choice.
Standard tools for Aircraft Maintenance are all in US units. Metric tools maybe required for maintenance.

GROUND SUPPORT EQUIPMENT AND TOOLS - STANDARD TOOLS

00 A/C HANDLING (1)

GROUND SUPPORT EQUIPMENT AND TOOLS (continued)

SPECIFIC TOOLS

Specific tools are tools designed by Airbus or by its vendors to carry out given maintenance tasks on the aircraft or one of its components. All maintenance tools for "on - aircraft" maintenance such as the AMM, Trouble Shooting Manual (TSM)... and for "off - aircraft" maintenance such as the Component Maintenance Manual (CMM) are found in the Support Equipment Summary (SES) document. The SES covers all Airbus aircraft types and all related documentation. If a tool does not appear in the SES it is not a tool for Airbus aircraft or equipment. All specific tools called up for "on - aircraft" maintenance in the AMM and the TSM are illustrated in the Tool Equipment Manual (TEM).

GROUND SUPPORT EQUIPMENT AND TOOLS - SPECIFIC TOOLS

00 A/C HANDLING (1)

GROUND SUPPORT EQUIPMENT AND TOOLS (continued)

STANDARD GSE

Airbus considers as standard GSE any GSE which is not designed for a specific aircraft type, but it can/could be used on a number of different aircraft types. Standard GSE includes, but is not limited: tow bars, axle/wheel change jacks, tripod maintenance jacks, access platforms, hydraulic ground carts, electrical power units, etc...

MAIN LANDING GEAR FLAT TYRES AXLE JACK

HYDRAULIC AXLE JACK

TRIPOD JACKS

TROLLEY JACK

SET OF FLYAWAY AXLE JACKS

TOW BAR AXLE

GROUND SUPPORT EQUIPMENT AND TOOLS - STANDARD GSE

G6B08031 - G10T4T0 - FM01D1000000001

31 COCKPIT PANELS PRESENTATION (1)

GENERAL

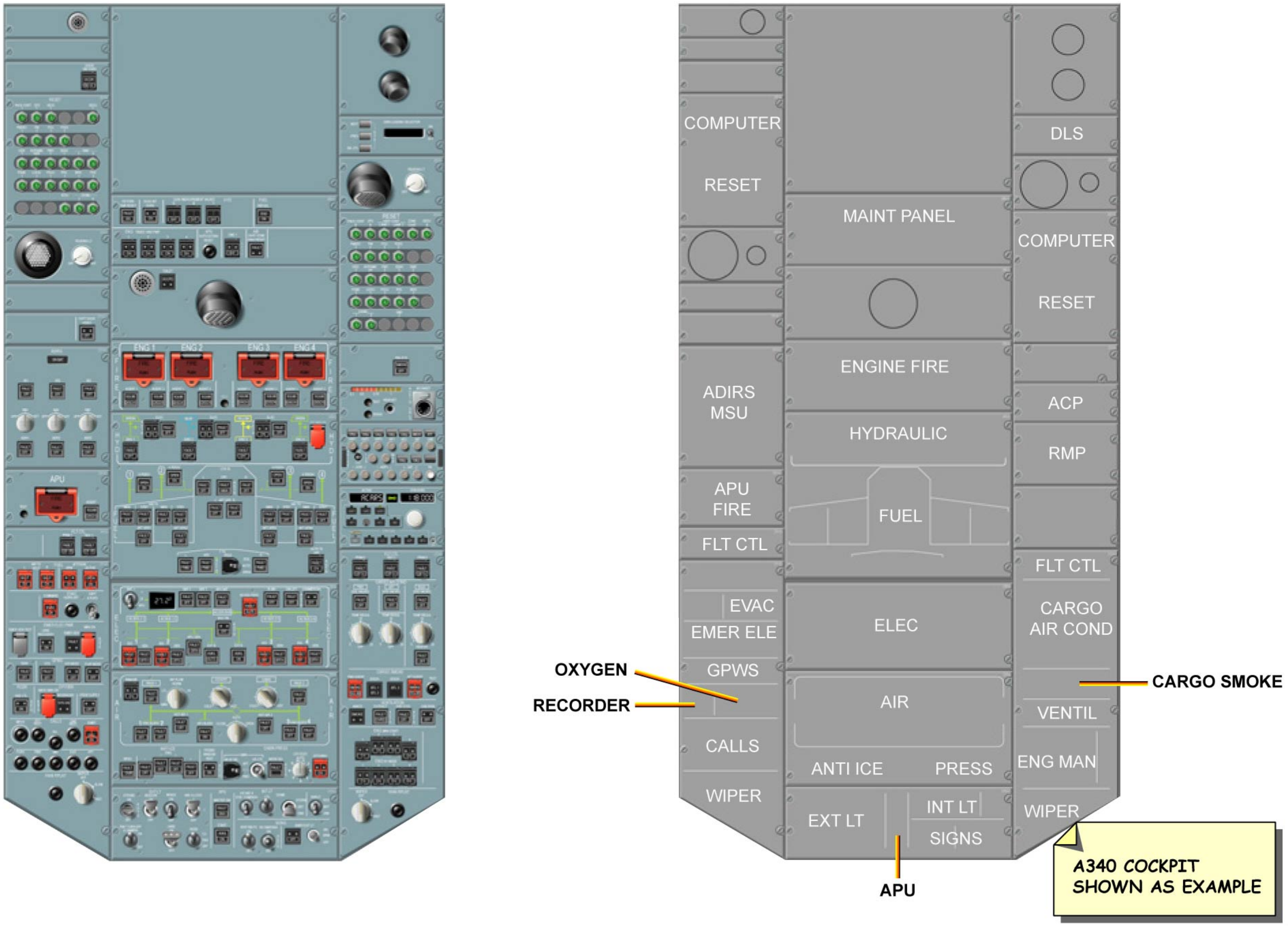
The cockpit comprises various panels: the overhead panel, the glareshield, the main instrument panel and the pedestal.
The aircraft is flown by using two side sticks located on the side consoles.

GENERAL

31 COCKPIT PANELS PRESENTATION (1)

OVERHEAD PANEL

Most of the aircraft system controls are located on the overhead panel, which also includes a maintenance panel for on-ground maintenance operations on some systems. The circuit breakers are no longer located in the cockpit, however some computers can be reset from two panels.



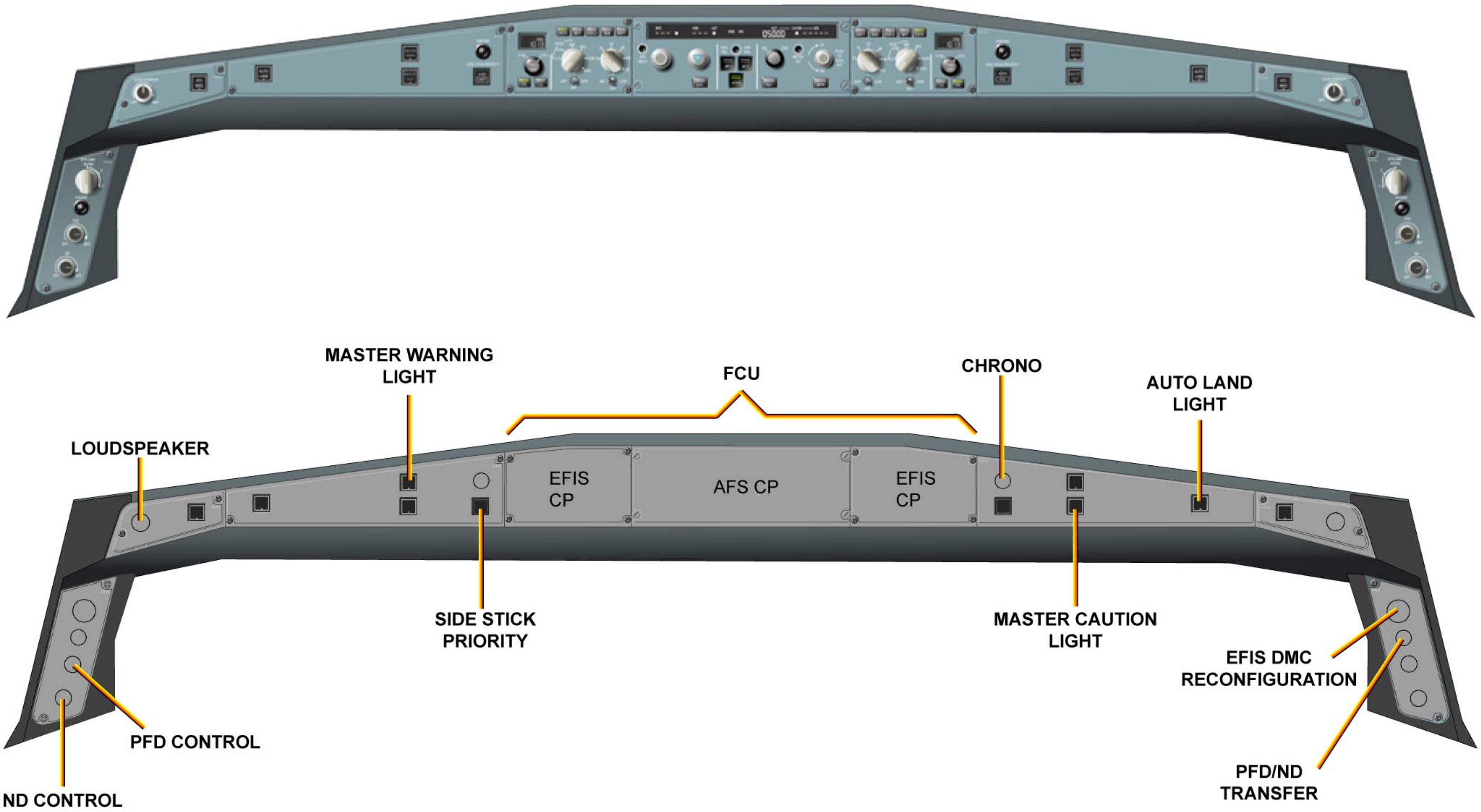
OVERHEAD PANEL

G6B08031 - G10T4T0 - FM31P1000000002

31 COCKPIT PANELS PRESENTATION (1)

GLARESHIELD

The glareshield includes the attention getters and the Flight Control Unit (FCU) made of an Auto Flight System (AFS) control panel and two Electronic Flight Instrument System (EFIS) control panels.



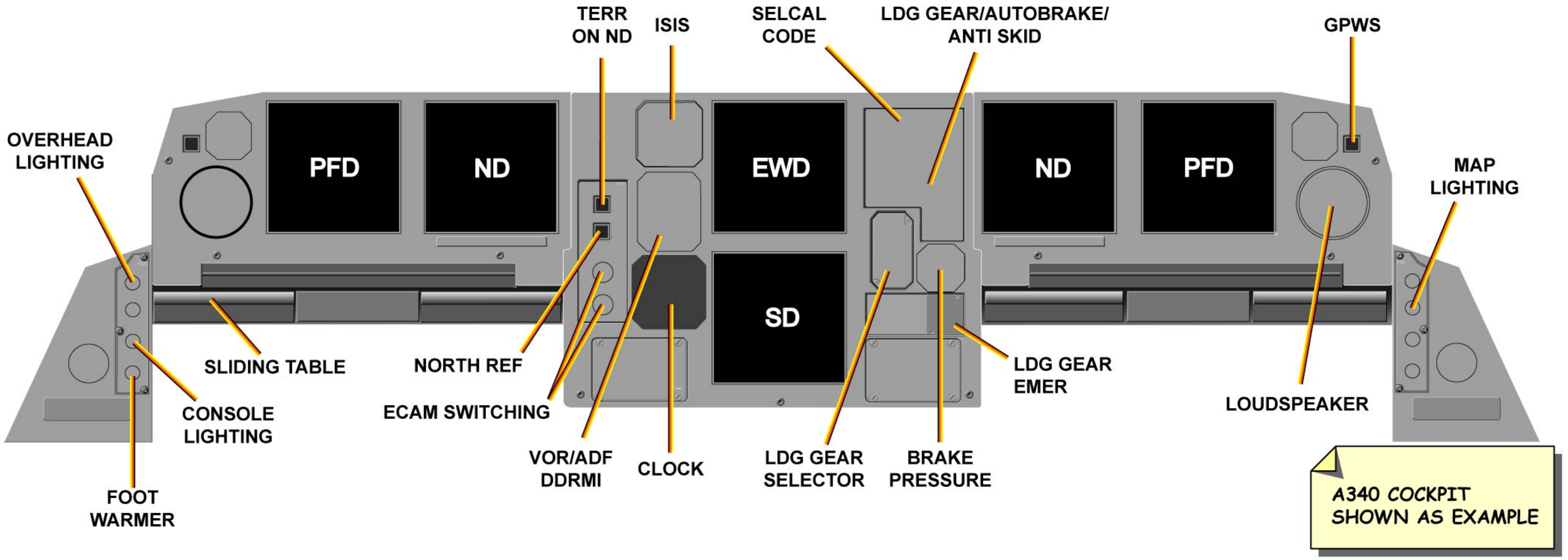
GLARESHIELD

G6B08031 - G10T4T0 - FM31P1000000002

31 COCKPIT PANELS PRESENTATION (1)

MAIN INSTRUMENT PANEL

The main instrument panel includes six identical and interchangeable Liquid Crystal Display (LCD) units which are composed of two Primary Flight Displays (PFDs), two Navigation Displays (NDs), an Engine/Warning Display (EWD) and a System Display (SD).



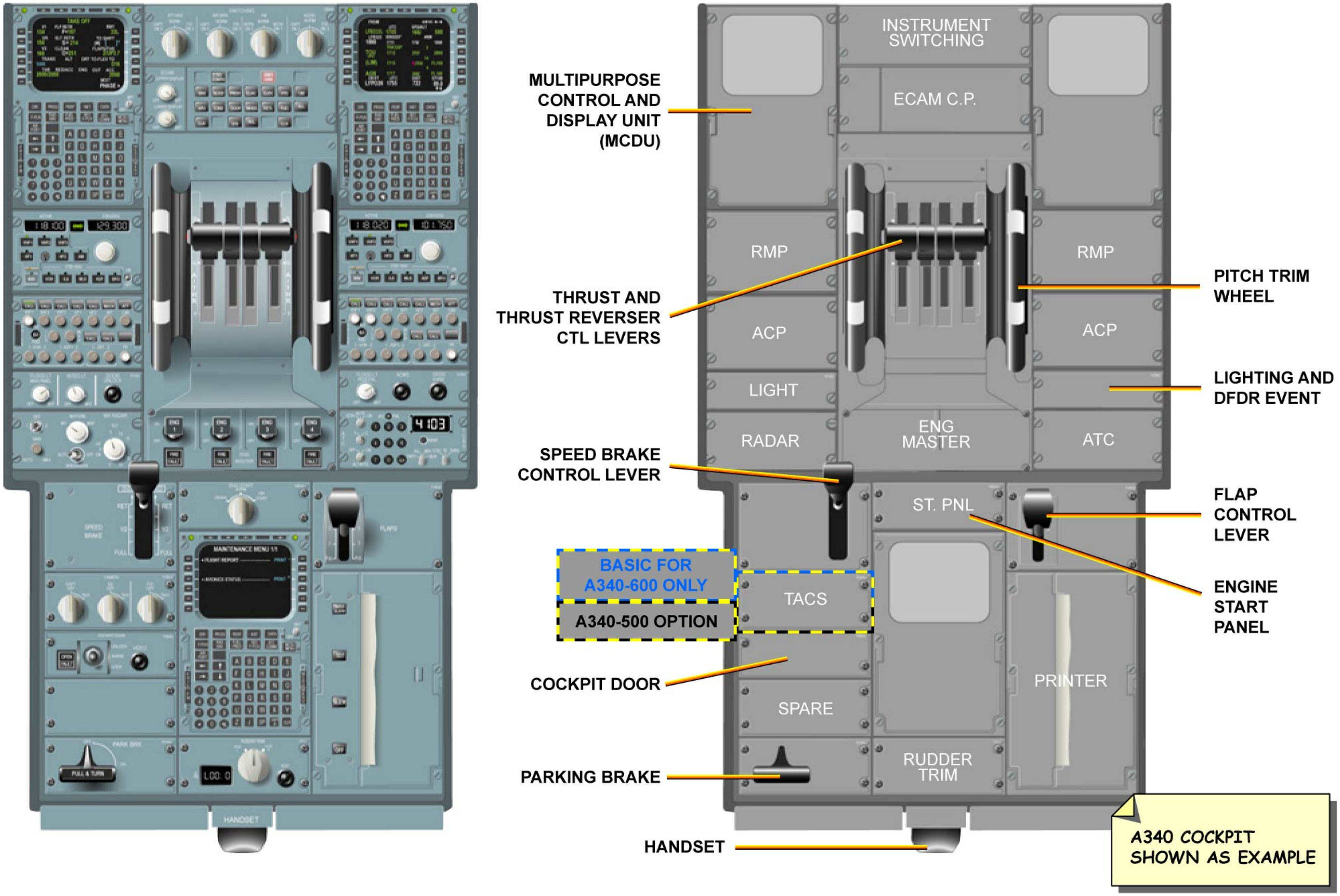
MAIN INSTRUMENT PANEL

G6B08031 - G10T4T0 - FM31P1000000002

31 COCKPIT PANELS PRESENTATION (1)

PEDESTAL

The pedestal includes some system control panels, and also three identical Multipurpose Control and Display Units (MCDUs) which supply an interface with some aircraft systems including the Central Maintenance System (CMS).
Usually, the two forward MCDUs are for the pilots and the rear one for maintenance use.


MULTIPURPOSE CONTROL AND DISPLAY UNIT (MCDU)
INSTRUMENT SWITCHING
ECAM C.P.
RMP
RMP
PITCH TRIM WHEEL
THRUST AND THRUST REVERSER CTL LEVERS
ACP
ACP
LIGHT
LIGHTING AND DFDR EVENT
RADAR
ENG MASTER
ATC
SPEED BRAKE CONTROL LEVER
ST. PNL
FLAP CONTROL LEVER
BASIC FOR A340-600 ONLY
A340-500 OPTION
TACS
ENGINE START PANEL
COCKPIT DOOR
PRINTER
SPARE
PARKING BRAKE
RUDDER TRIM
HANDSET
A340 COCKPIT SHOWN AS EXAMPLE

PEDESTAL

31 COCKPIT PANELS PRESENTATION (1)

LIGHTS OUT PHILOSOPHY

In normal operation, no annunciator lights are illuminated in the cockpit.
This is called "lights out philosophy".

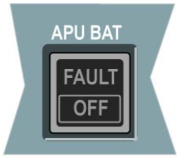
LIGHTS OUT PHILOSOPHY

31 COCKPIT PANELS PRESENTATION (1)

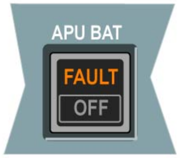
COLOR PHILOSOPHY

The pushbuttons and annunciators are of different colors according to their function. In normal operation, only green lights and sometimes blue lights come on.

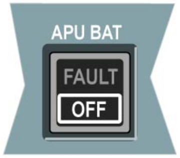
PUSHBUTTON PRINCIPLE



PRESSED IN
NO LIGHT
SYSTEM ACTIVATED
CORRECT OPERATION



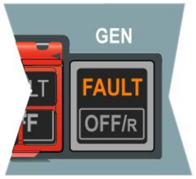
PRESSED IN
FAULT LIGHT ON
SYSTEM ACTIVATED
FAULTY CONDITION



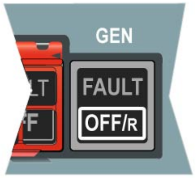
RELEASED OUT
OFF LIGHT ON
SYSTEM DEACTIVATED

COLOUR PHILOSOPHY

RED IS USED FOR A FAILURE NEEDING IMMEDIATE ACTION



AMBER IS USED FOR A FAILURE NEEDING AWARENESS BUT NO IMMEDIATE ACTION



WHITE IS USED TO INDICATE A PUSHBUTTON IN ABNORMAL POSITION OR MAINTENANCE OPERATION

GREEN IS USED TO INDICATE NORMAL OPERATION OF A BACK UP SYSTEM

BLUE IS USED TO INDICATE NORMAL OPERATION OF A TEMPORARILY USED SYSTEM

COLOR PHILOSOPHY

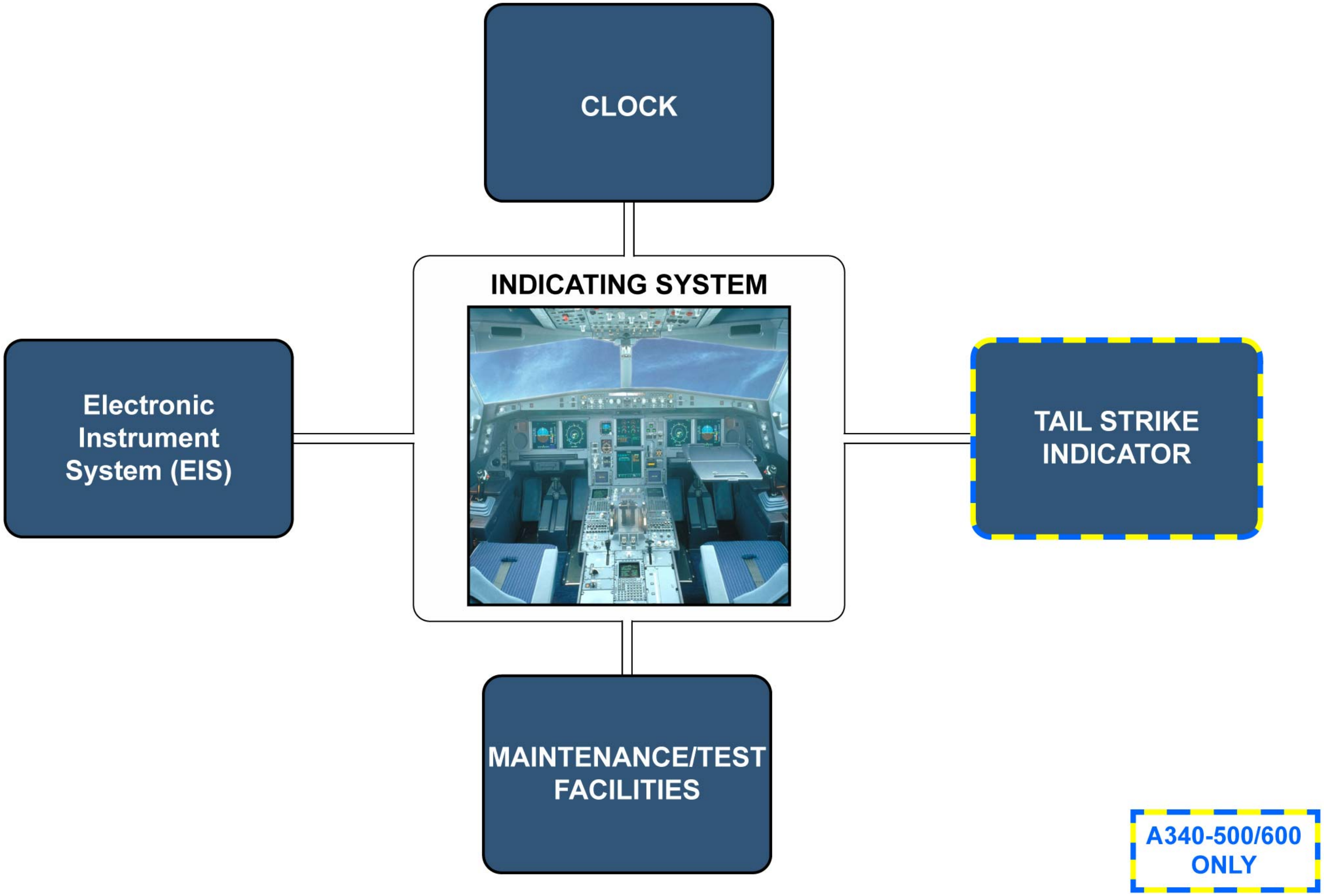
G6B08031 - G10T4T0 - FM31P1000000002

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM

GENERAL

The indicating system has:
- Electronic Instrument System (EIS),
- clock,
- tail strike indicator for the A340-500 and 600,
- maintenance/test facilities.



INDICATING SYSTEM - GENERAL

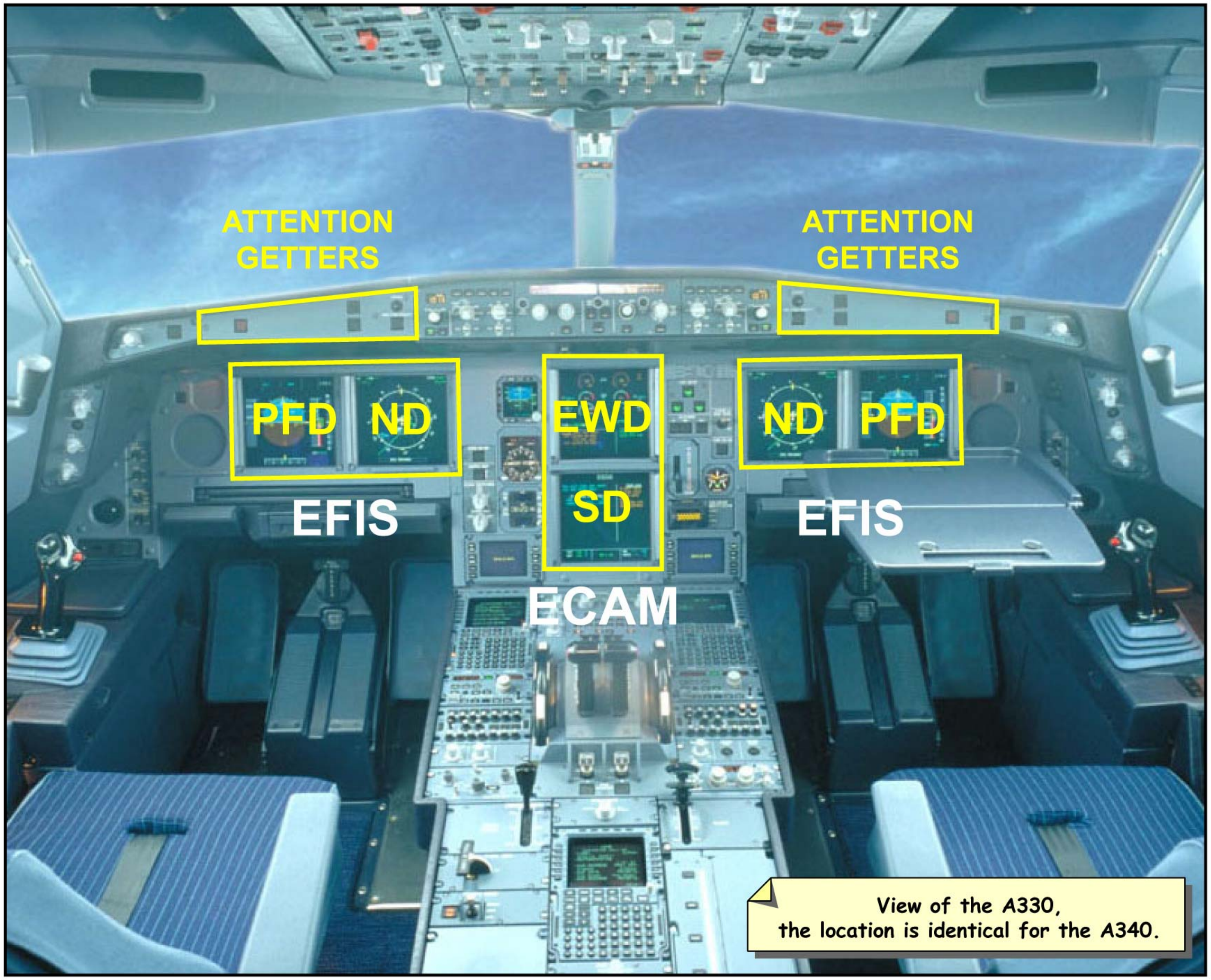
G6B08031 - G10T4T0 - FM31PC000000001

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

EIS

The EIS presents data to the pilots on six identical and interchangeable Liquid Crystal Display (LCD) units. This EIS is divided into 2 parts:
- the Electronic Flight Instrument System (EFIS) composed of two Primary Flight Displays (PFDs) and two Navigation Displays (NDs),
- the Electronic Centralized Aircraft Monitoring (ECAM) composed of an Engine/Warning Display (EWD) a System Display (SD) and attention getters.



INDICATING SYSTEM - EIS

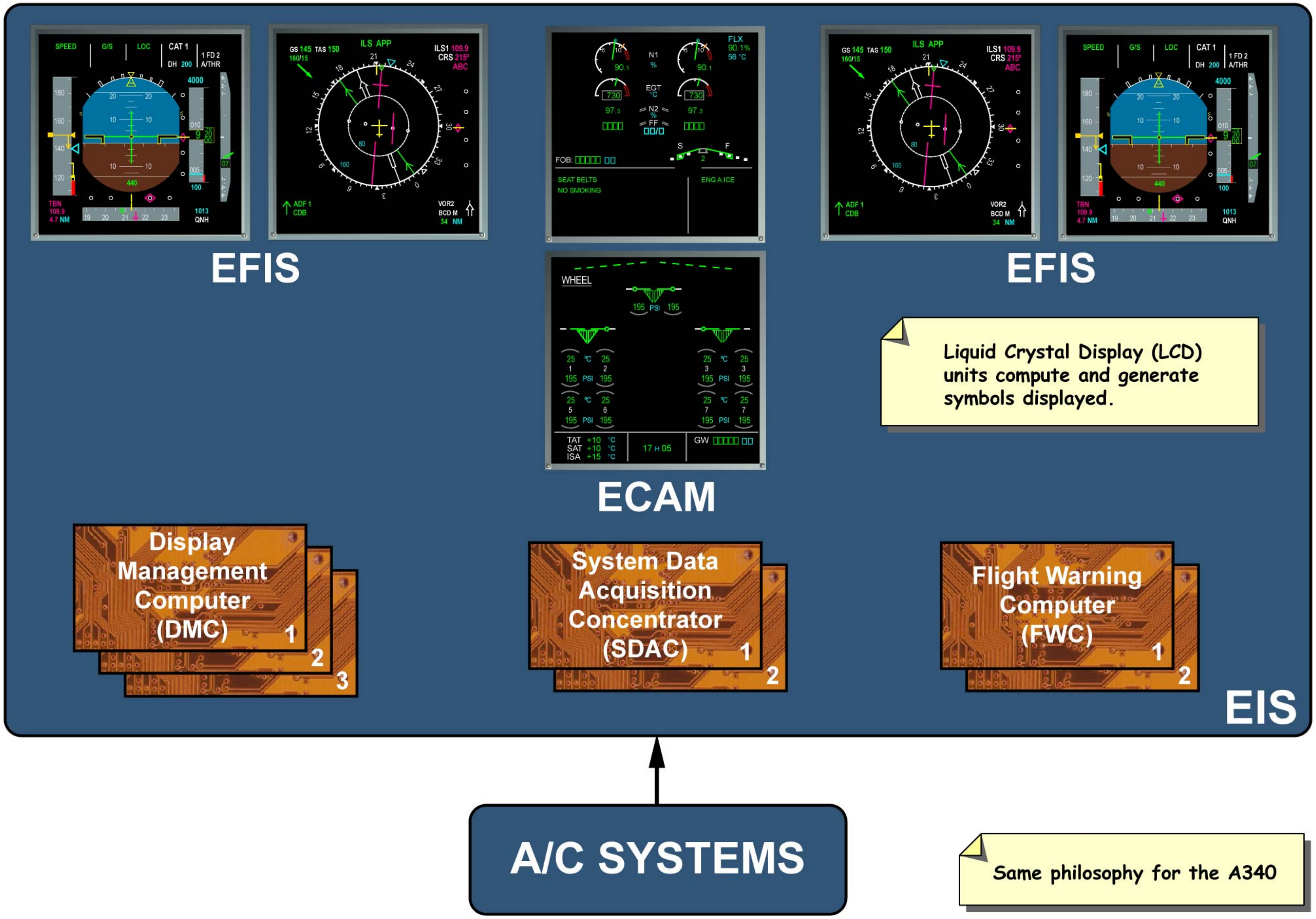
31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

PHILOSOPHY

The EIS is an avionics system connected to most of the aircraft systems to fulfill the EFIS and ECAM functions. The EIS comprises 7 computers:
- 3 identical and interchangeable Display Management Computers (DMCs),
- 2 identical and interchangeable Flight Warning Computers (FWCs),
- 2 identical and interchangeable System Data Acquisition Concentrators (SDACs).

The 6 LCD units have the capability to compute and generate the symbols to be displayed from data, sent by the DMCs. On the A340-500 and A340-600 aircraft, it is also possible to display video image.



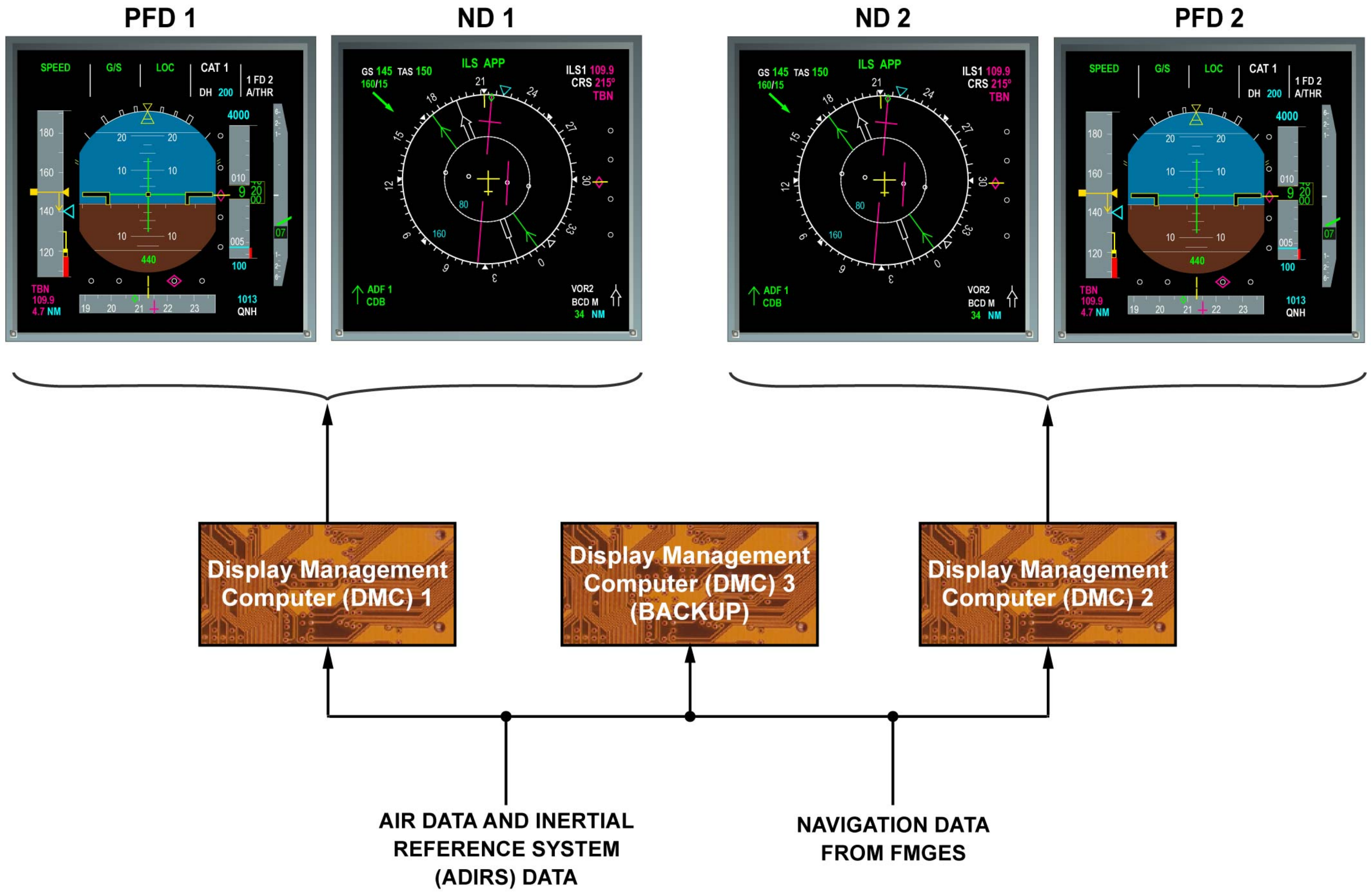
INDICATING SYSTEM - PHILOSOPHY

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

EFIS ARCHITECTURE

The 3 identical and interchangeable DMCs can be considered as data concentrators. They are in charge of acquiring data and parameters from various aircraft systems and to process them for sending to the display units. The DMC 1 normally drives the CAPT PFD and ND, and the DMC 2 normally drives the F/O PFD and ND. The DMC 3 is in standby and can be used in case of DMC 1 and/or 2 failure. For the EFIS displays, data from the Air Data and Inertial Reference System (ADIRS) and the navigation data from the Flight Management Guidance and Envelope System (FMGES) are sent directly to the DMCs.



INDICATING SYSTEM - EFIS ARCHITECTURE

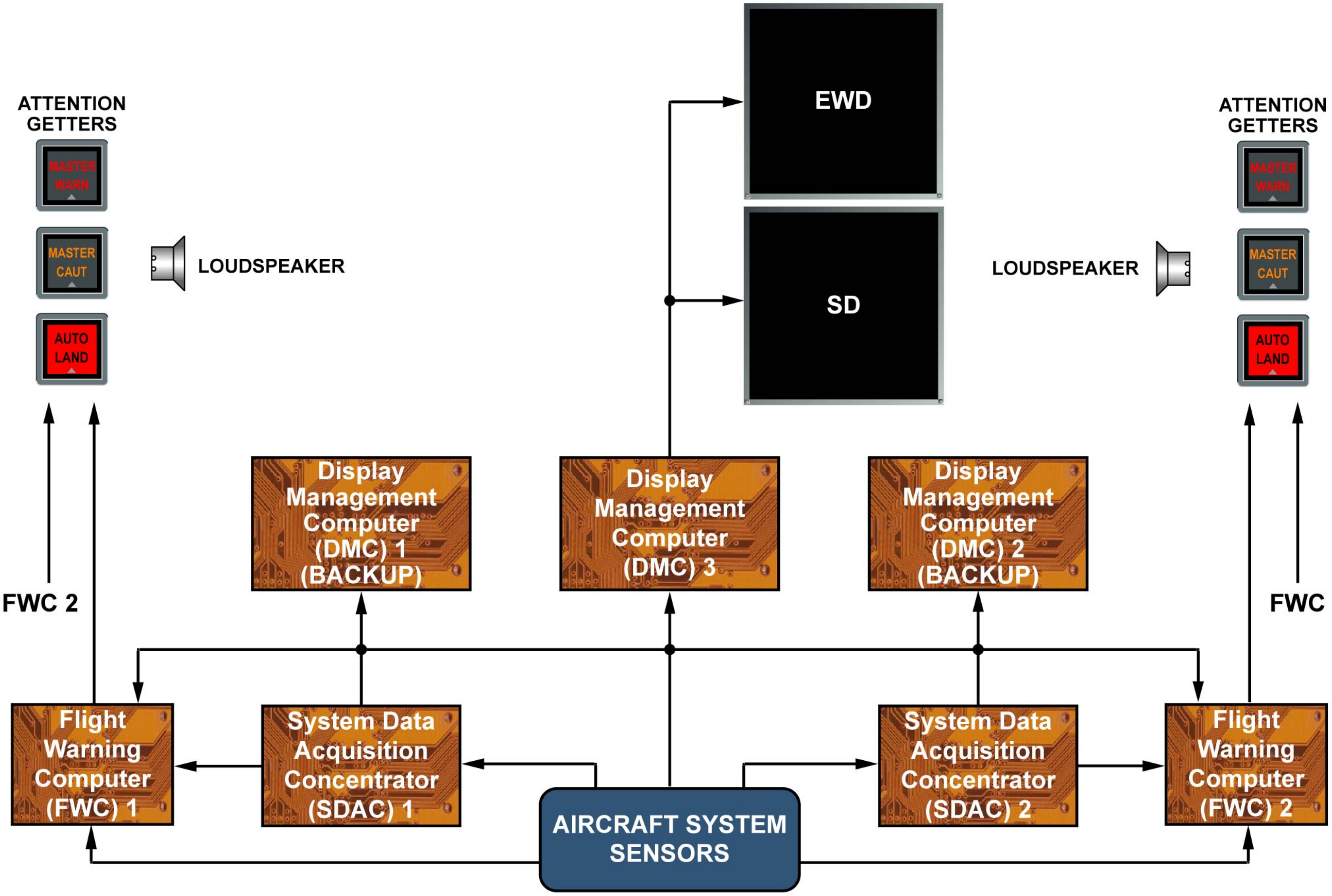
31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

ECAM ARCHITECTURE

The DMC 3 normally drives the EWD and the SD. The ECAM function is achieved by the SDACs and the FWCs. The SDACs fulfill 3 main functions:
- data acquisition from the aircraft systems,
- data concentration,
- data digitizing to be sent to the DMCs for display on the SD.

The FWCs generate all warning messages and activate attention getters (MASTER WARNing, MASTER CAUTion and AUTOLAND) as well as
audio signals and auto call-outs (synthetic voices) broadcasted by two loudspeakers. There is no volume control for the audio signals.



INDICATING SYSTEM - ECAM ARCHITECTURE

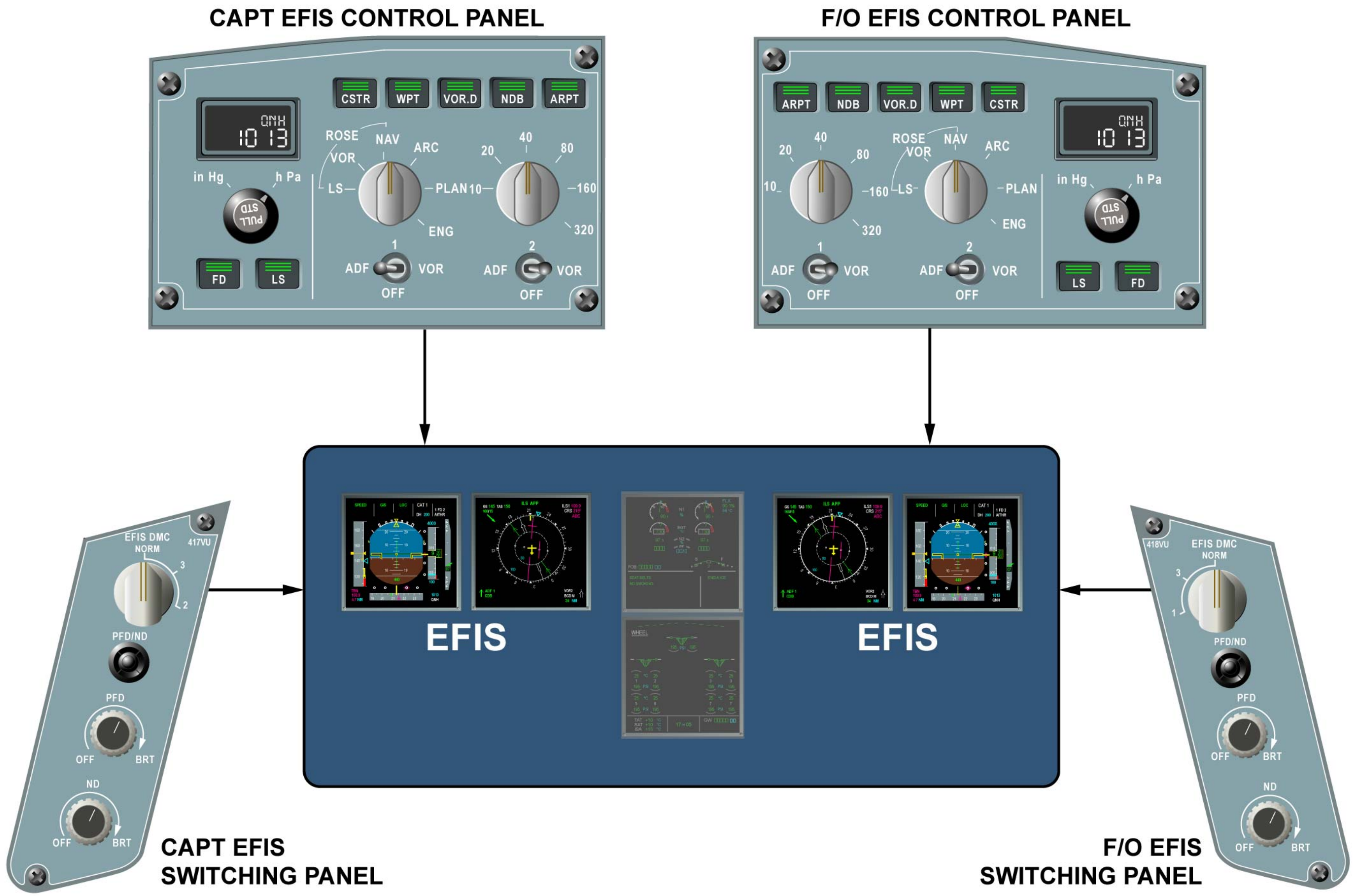
G6B08031 - G10T4T0 - FM31PC000000001

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

EFIS CONTROL AND INDICATING

The EFIS information is presented in front of each pilot on a PFD and ND. The PFD displays the basic flight information required for short-term flight. The ND displays the flight information required for navigation. For each pilot, there is an EFIS control panel for the selection of display modes. The two EFIS control panels are part of the FCU (Flight Control Unit). An EFIS switching panel for each pilot is also installed for reconfiguration functions.



INDICATING SYSTEM - EFIS CONTROL AND INDICATING

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

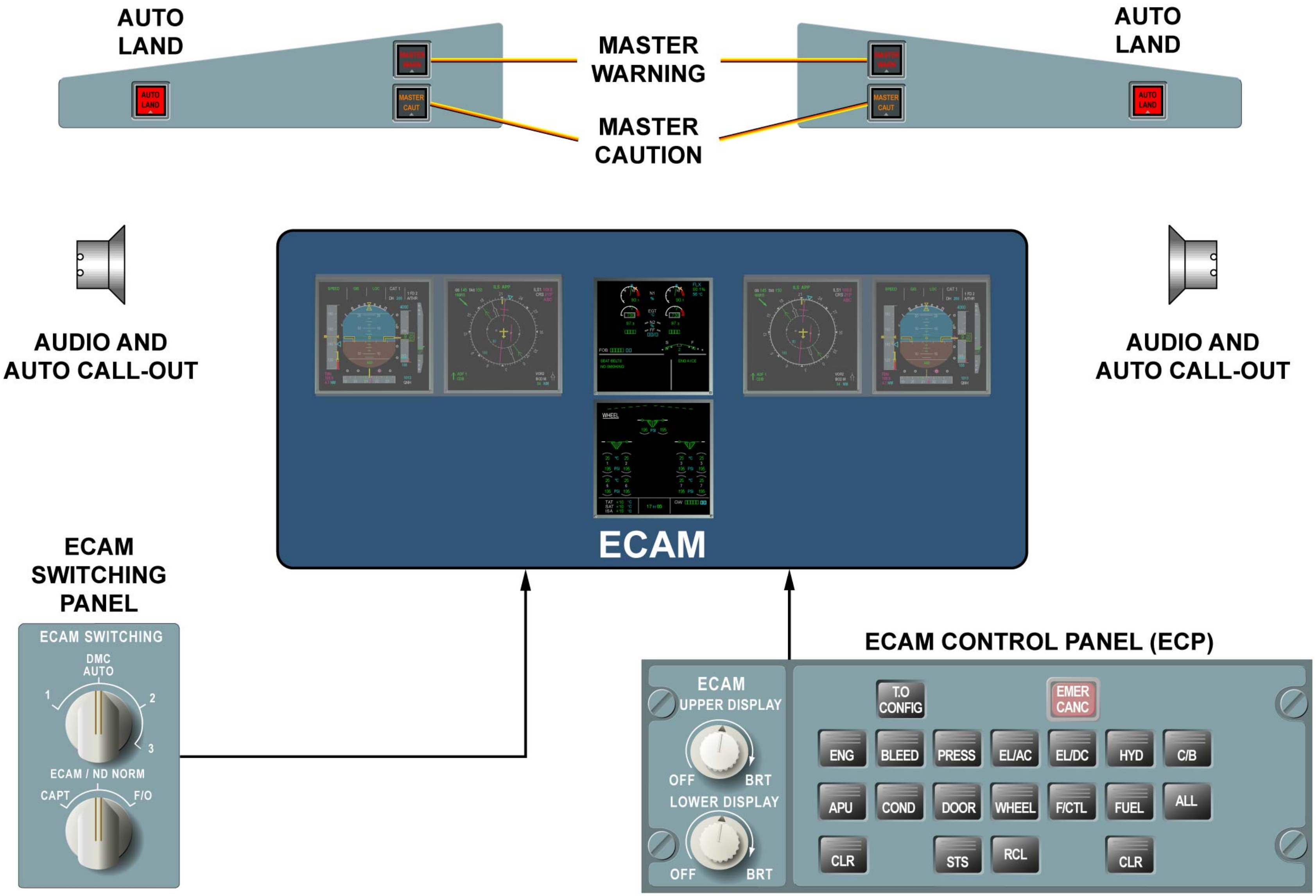
ECAM CONTROL AND INDICATING

The ECAM information is presented on the center instrument panel on an EWD and a SD. The EWD displays engine parameters, Fuel On Board (FOB), slat and flap position, warnings and memo messages. The SD displays synoptic diagrams giving the configuration of various aircraft systems. The ECAM controls are given by the ECAM Control Panel (ECP) for display and by the ECAM switching panel for reconfiguration.
The pilot's attention is drawn by:
- 2 MASTER CAUT,
- 2 MASTER WARN,
- 2 AUTOLAND warning lights and,
- audio sounds and auto call-out (synthetic voices), which are broadcasted by 2 loudspeakers.

The EWD, also called upper ECAM Display Unit (DU), is normally on the upper ECAM DU. It is divided into two areas: the upper area and the lower area.
The upper area displays:
- engine primary parameters,
- FOB,
- slats and flaps position.

The lower area is used for:
- warning and caution messages,
- secondary failures and memo messages.

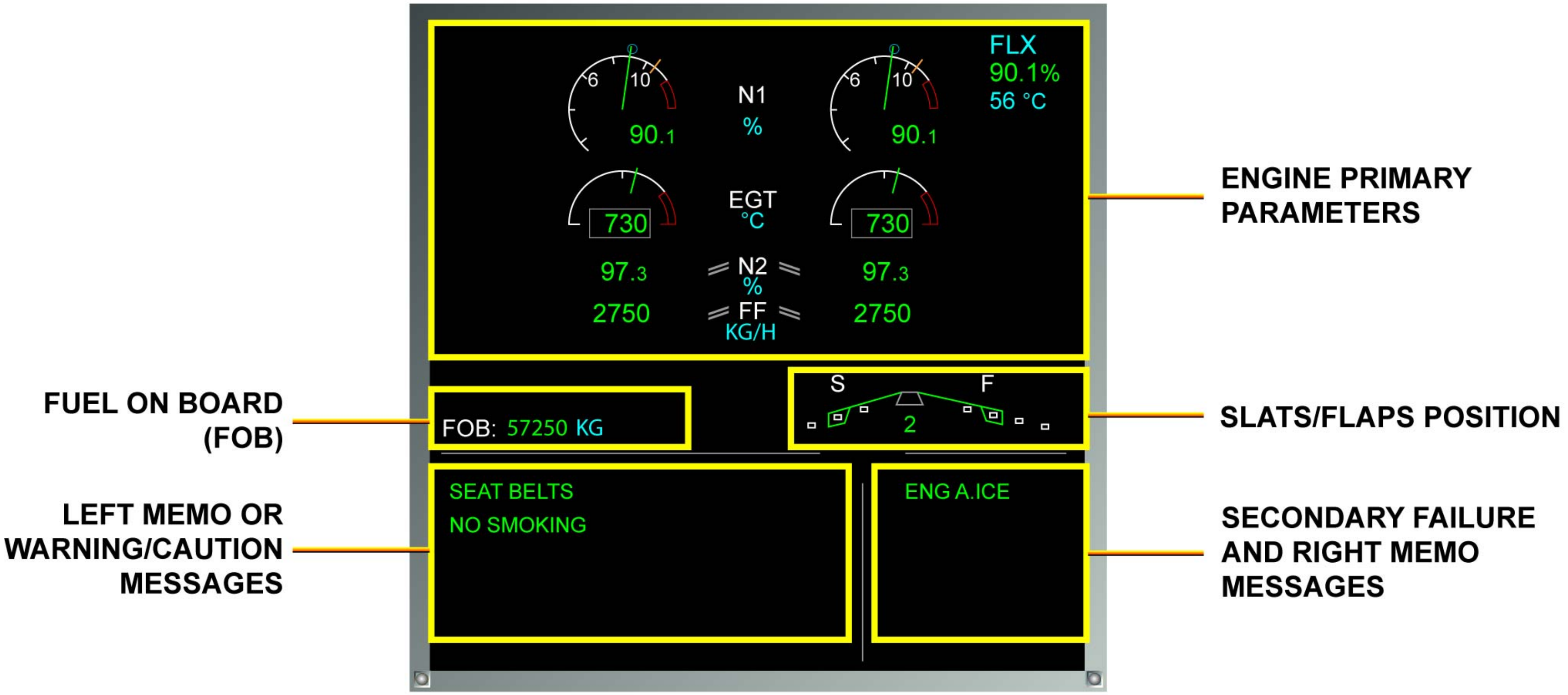
The SD, also called lower ECAM DU, is divided into two areas. The upper area displays system or status pages, which appear automatically or manually through the ECP. The lower area displays the permanent data.



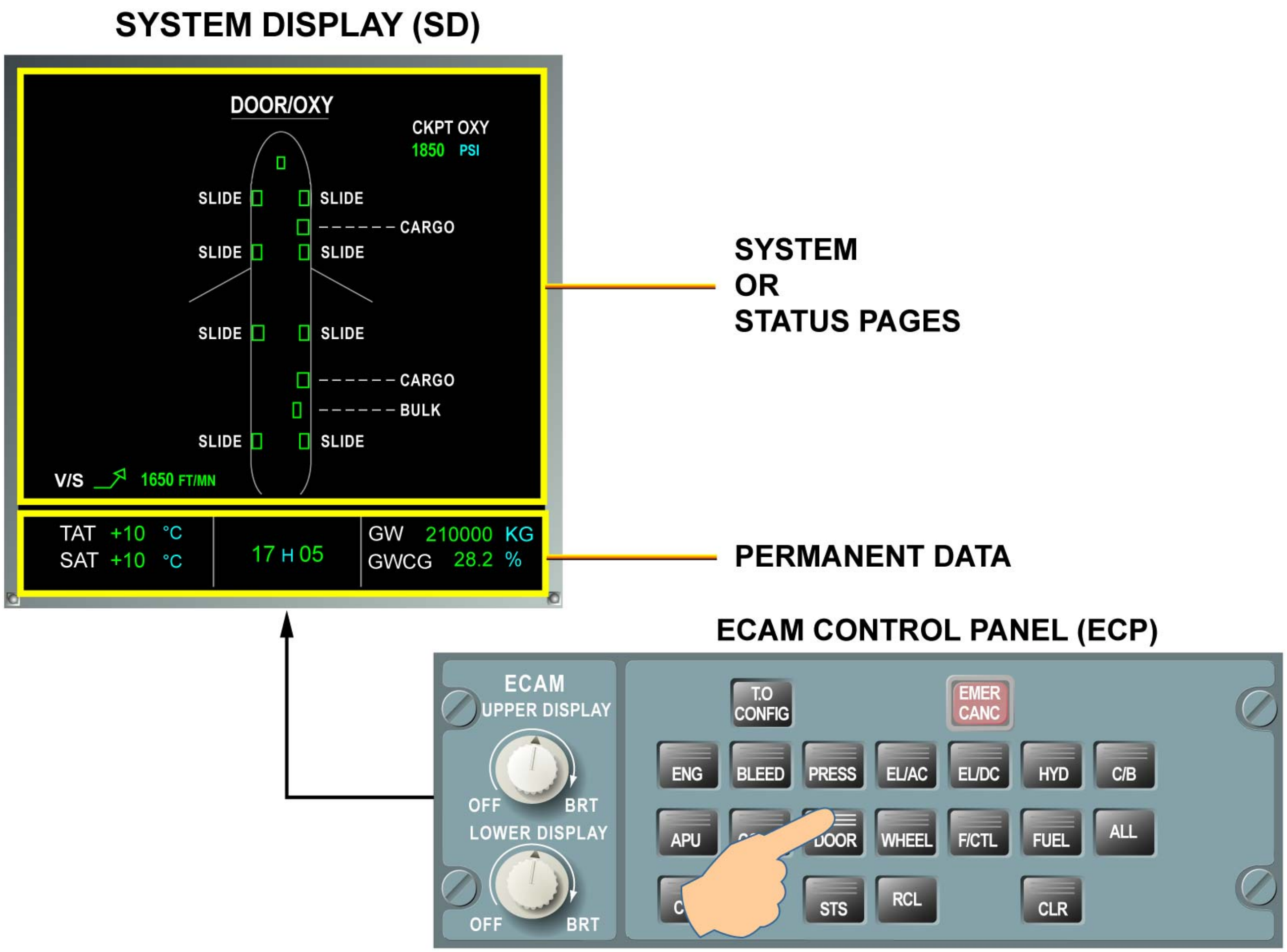
INDICATING SYSTEM - ECAM CONTROL AND INDICATING

As an example, parameters are given for an A330 equipped with GE engines, in metrics units. The philsosophy is the same for the A340.

ENGINE/WARNING DISPLAY (EWD)



As an example, parameters are given in metrics units.



INDICATING SYSTEM - ECAM CONTROL AND INDICATING

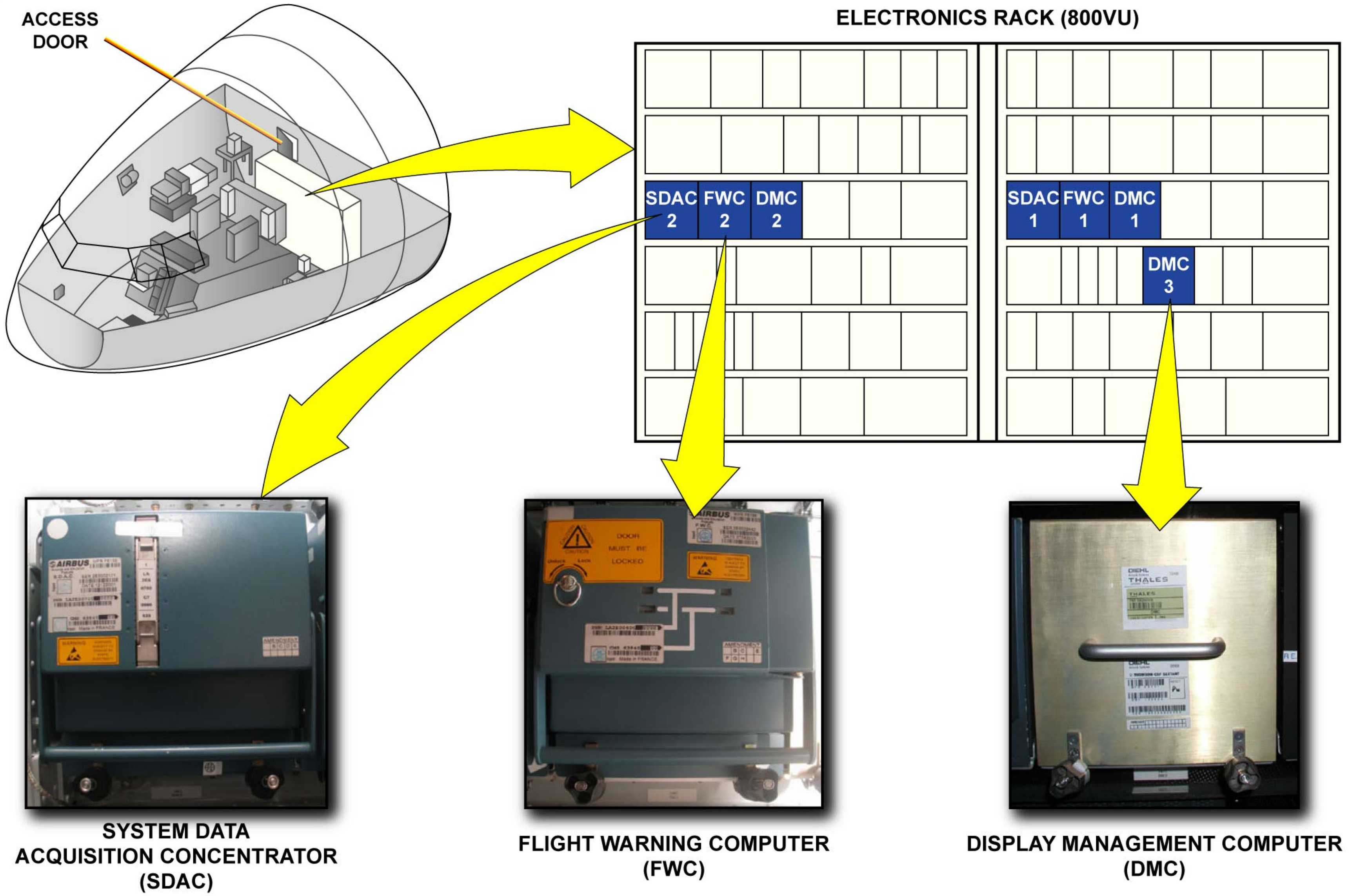
31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

COMPONENT LOCATION

The EIS computers are located in the main avionics rack.

G6B08031 - G10T4T0 - FM31PC000000001



INDICATING SYSTEM - COMPONENT LOCATION

G6B08031 - G10T4T0 - FM31PC000000001

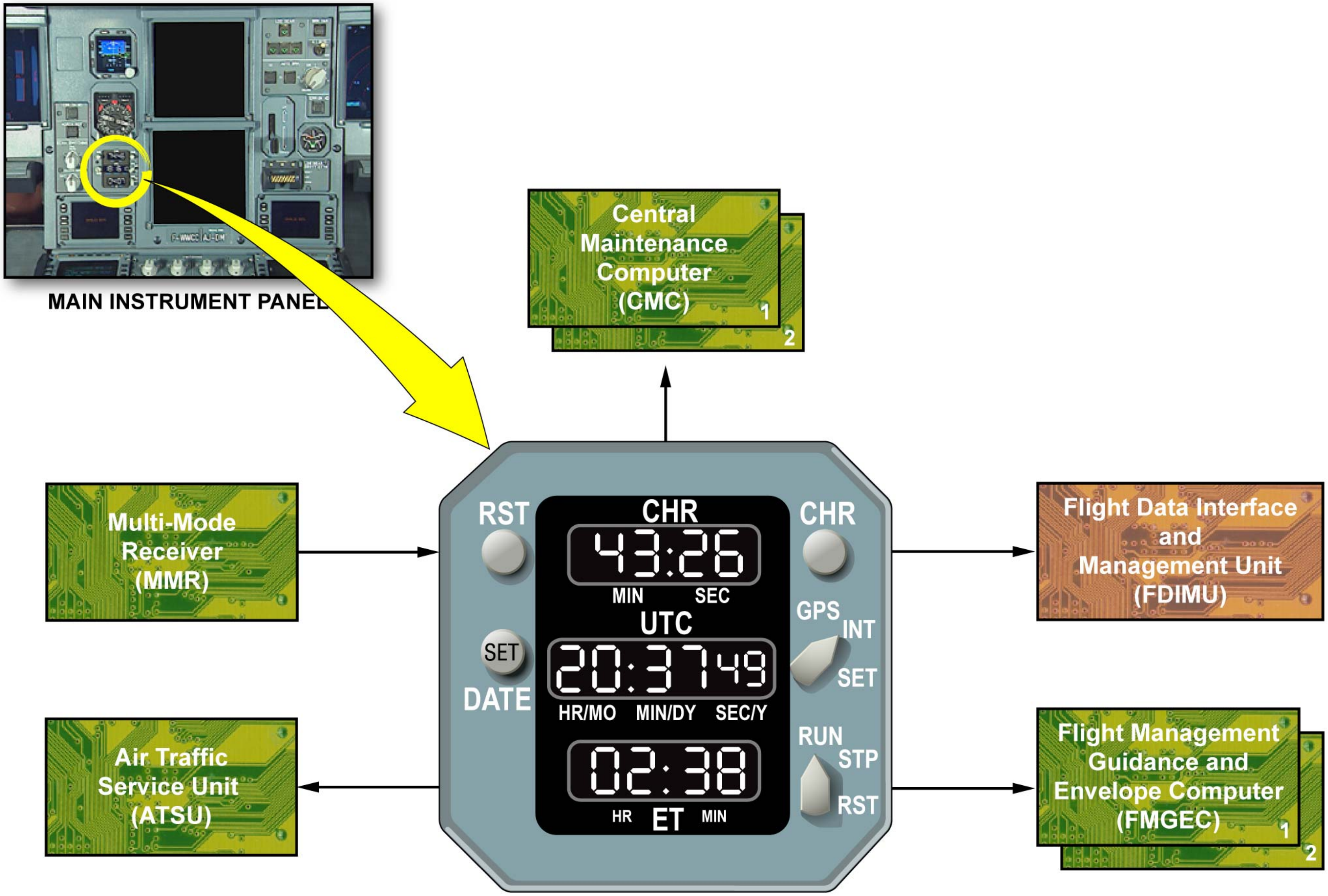
31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

ELECTRICAL CLOCK

The electrical clock is located on the main instrument panel and gives Universal Time Coordinated (UTC), Elapsed Time (ET), a Chronometer (CHR) and dates information. The electrical clock gives UTC to the:
- Central Maintenance Computers (CMCs) for failure message report definition on the MCDU,
- Flight Data Interface and Management Unit (FDIMU) for recording system and monitoring system,
- Flight Management Guidance and Envelope Computers (FMGECs) for their memory access synchronization,
- Air Traffic Service Unit (ATSU) for the Air Traffic and Information Management System (ATIMS) synchronization with the GPS.

The electrical clock receives information from the Multi-Mode Receiver (MMR) synchronizing it with GPS time from satellite.



INDICATING SYSTEM - ELECTRICAL CLOCK

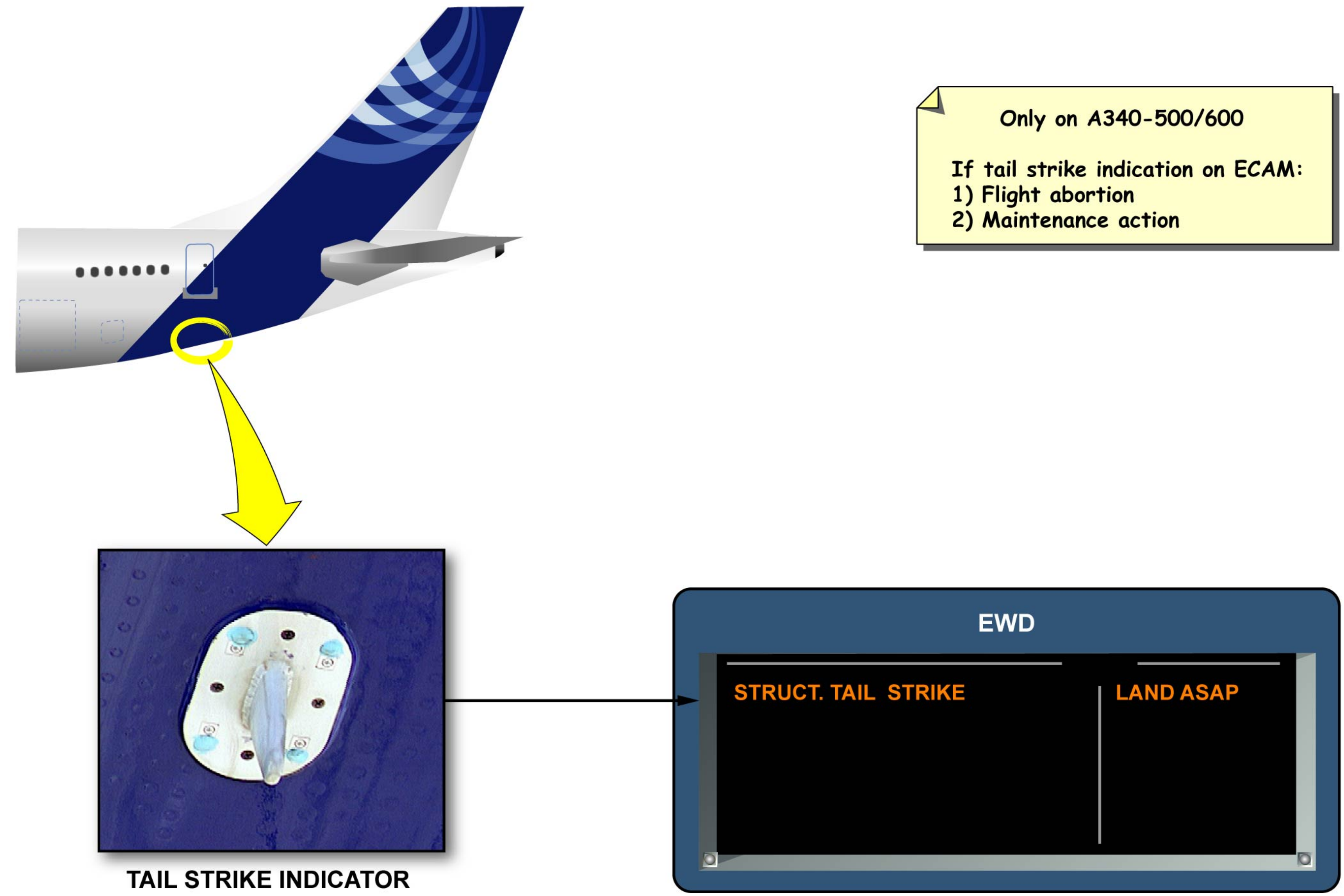
G6B08031 - G10T4T0 - FM31PC000000001

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

TAIL STRIKE INDICATOR

Because of the A340-500/600 fuselage length, a definitive way to determine if there is a tail strike during the take off or landing phase is necessary. The tail strike indication is an attention getter for the flight crew. The sensor is mounted at the rear of the fuselage. If the fuselage contacts the ground during takeoff or landing the crew is notified through ECAM. This system provides potentially critical information to the crew, so they can return to the airport to make sure that there will be proper maintenance action after a tail strike.



INDICATING SYSTEM - TAIL STRIKE INDICATOR

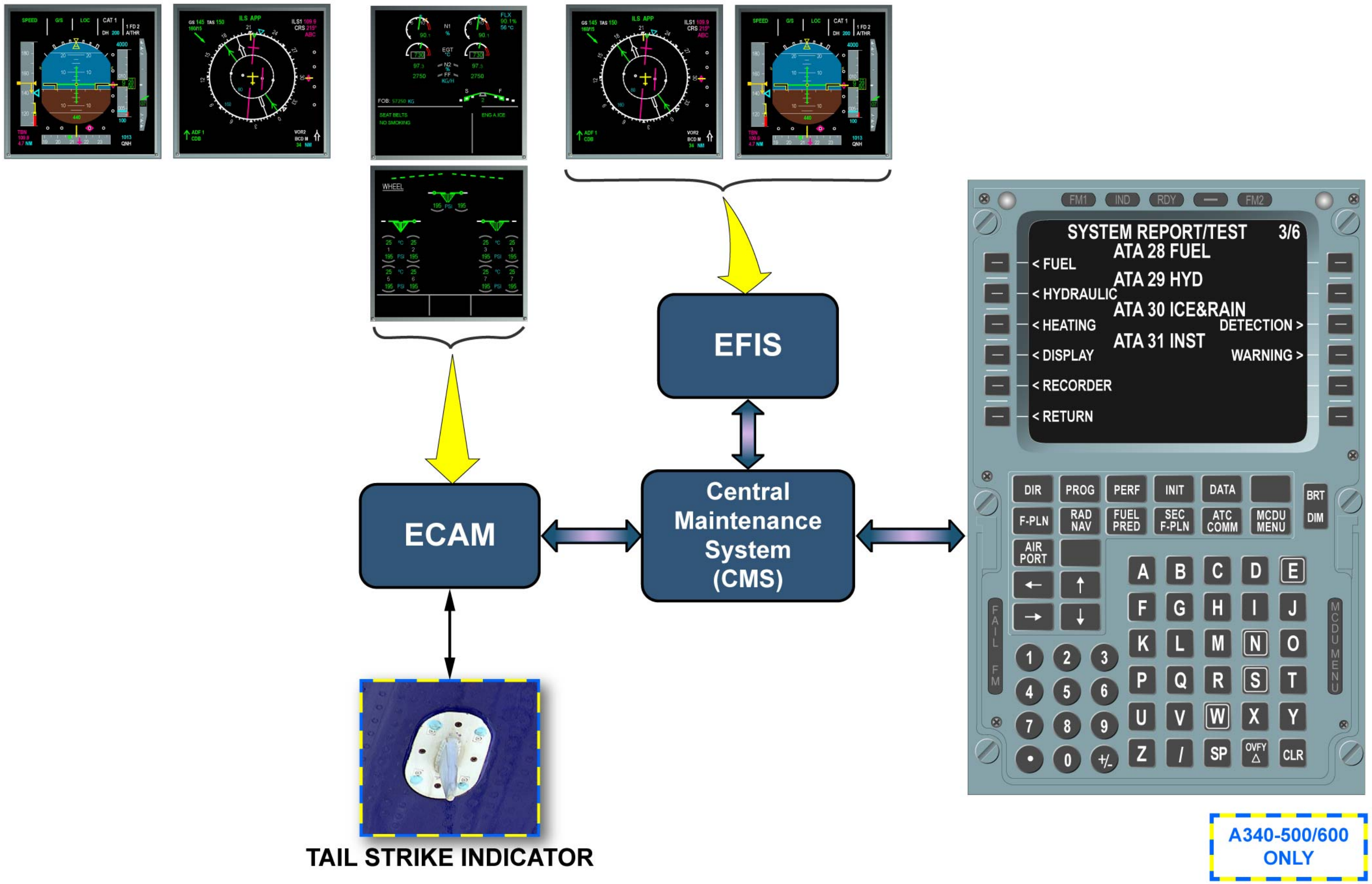
31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

INDICATING SYSTEM (continued)

MAINTENANCE TEST/FACILITIES

EIS failure and tail strike indication failure information are transmitted to the Central Maintenance System (CMS) and retrieved through the MCDU. The MCDU is also used to initiate system test.

EFIS AND ECAM DISPLAY UNITS



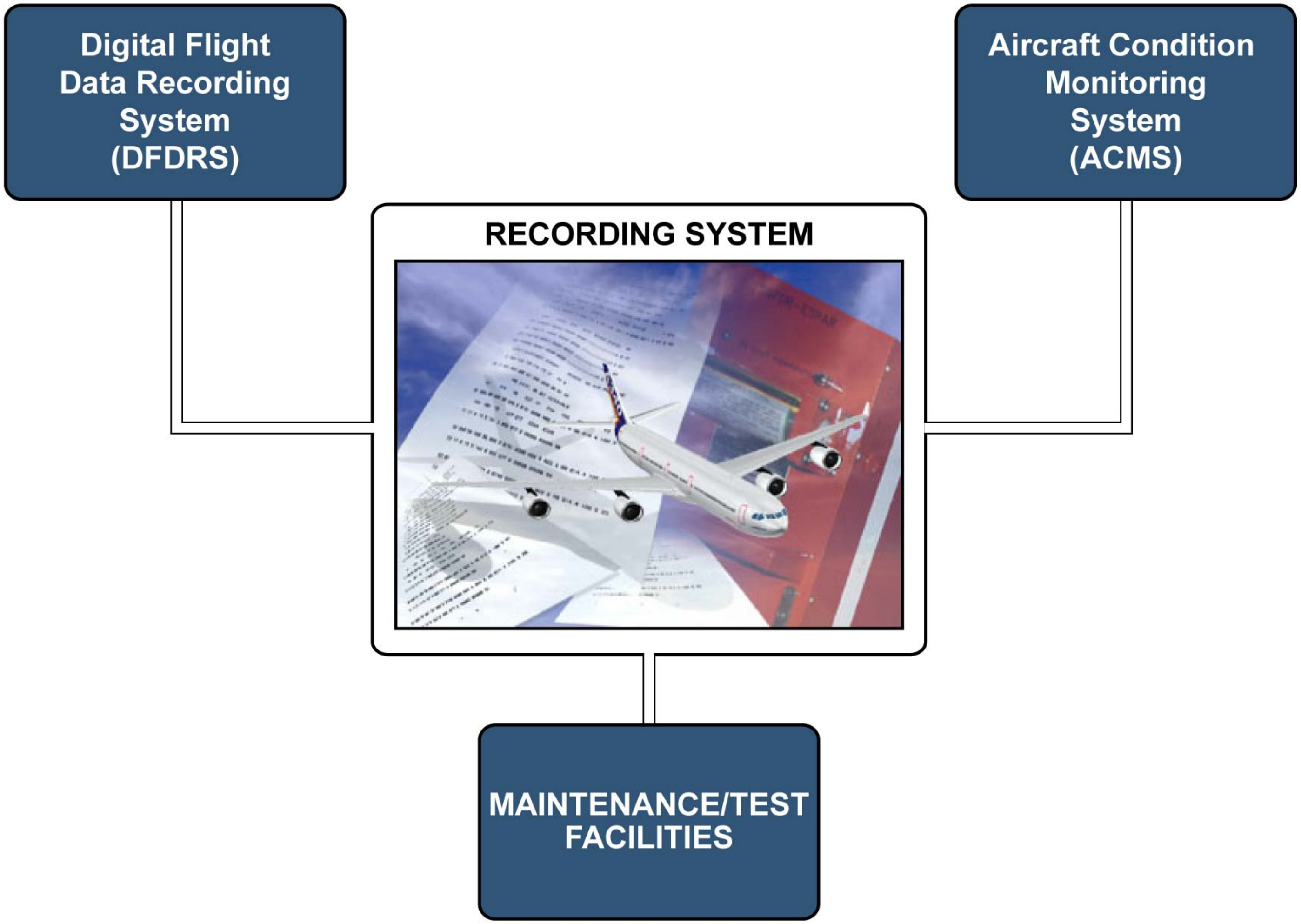
INDICATING SYSTEM - MAINTENANCE TEST/FACILITIES

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

RECORDING SYSTEM

GENERAL

The recording system groups are:
- Digital Flight Data Recording System (DFDRS),
- Aircraft Condition Monitoring System (ACMS),
- maintenance/test facilities.



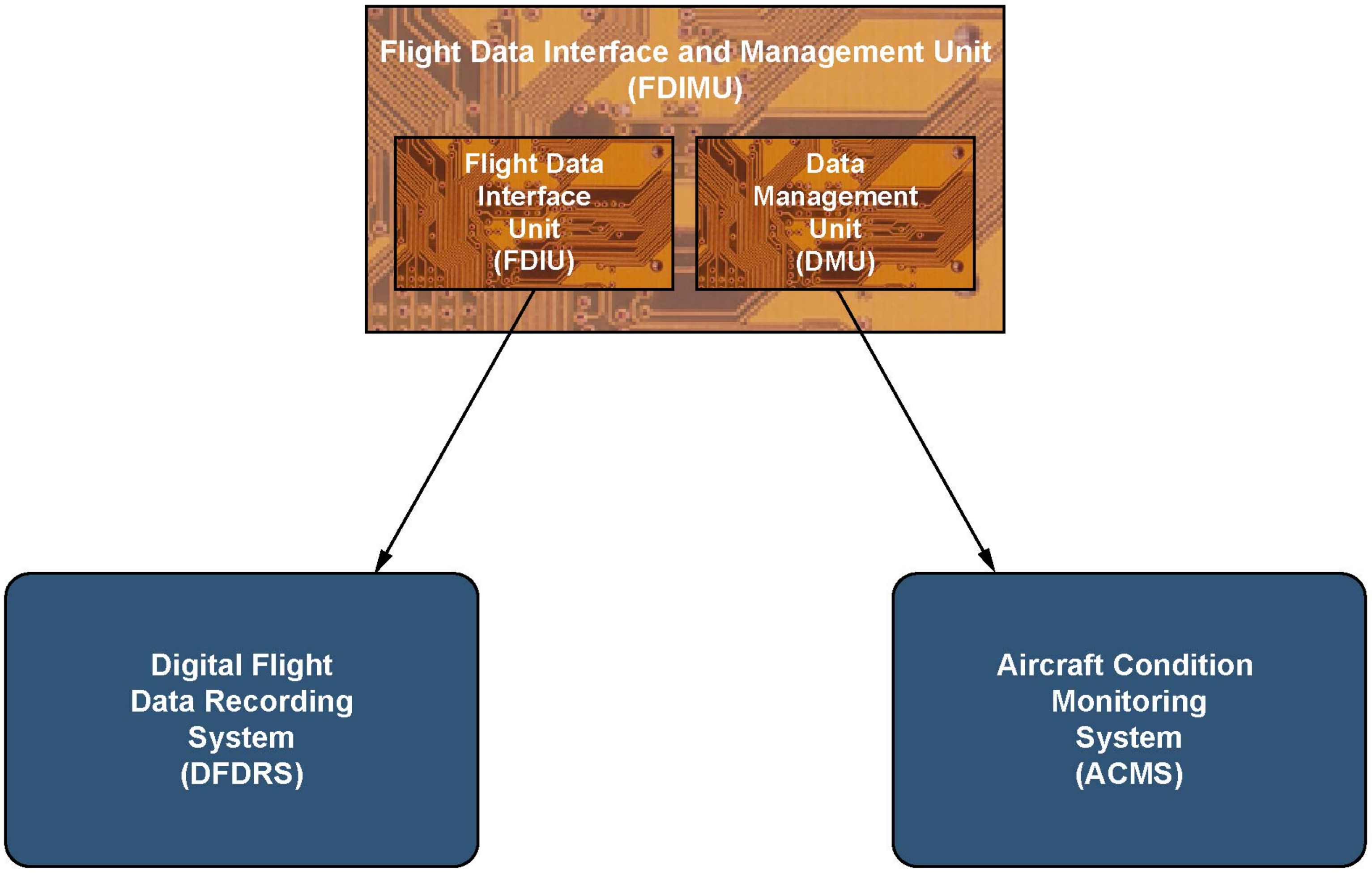
RECORDING SYSTEM - GENERAL

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

RECORDING SYSTEM (continued)

FDIMU

Two independent recording functions are accomplished with the FDIMU. It combines the Flight Data Interface Unit (FDIU), which collects parameters for the DFDRS, and the Data Management Unit (DMU), which collects parameters for the ACMS.



RECORDING SYSTEM - FDIMU

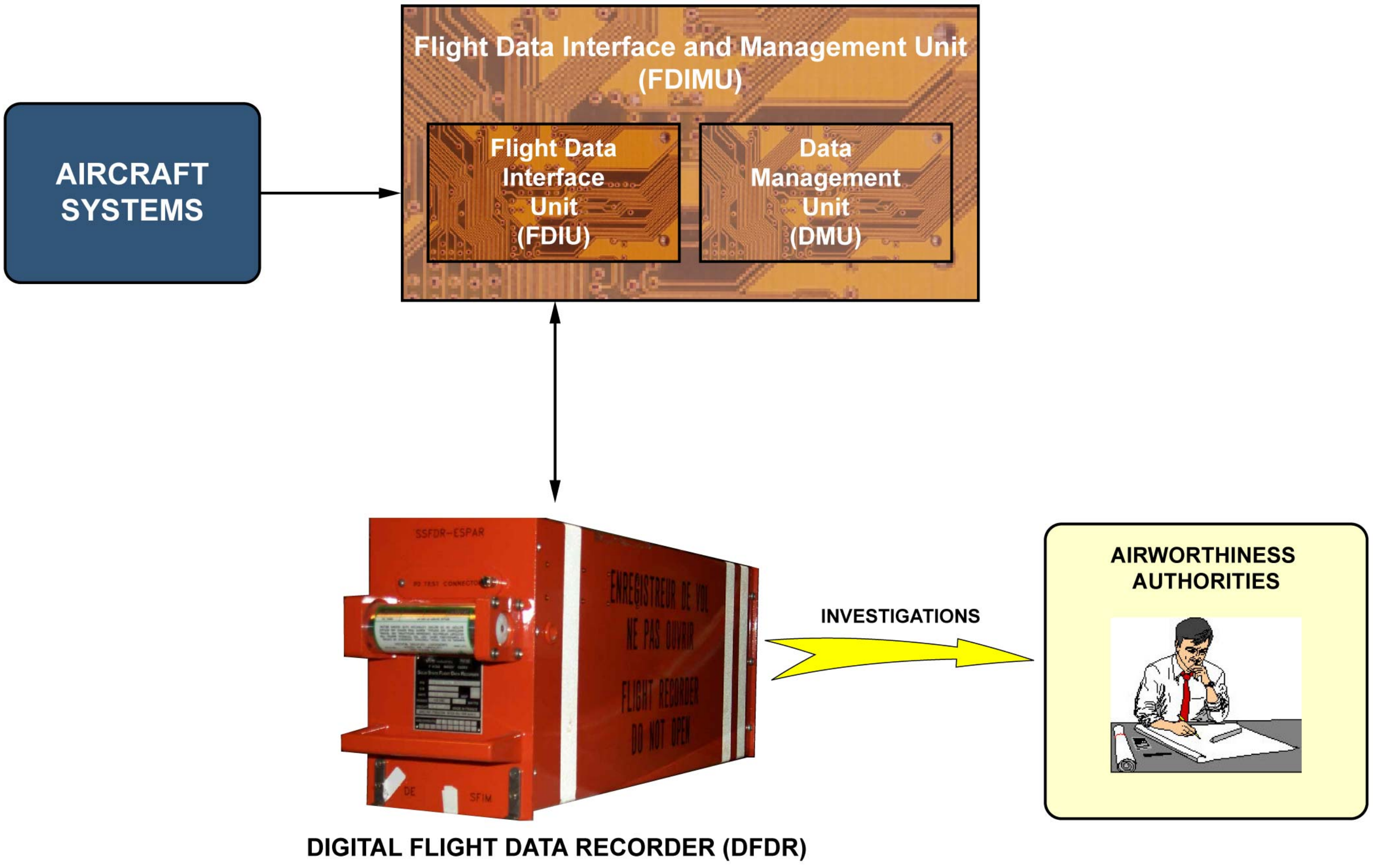
G6B08031 - G10T4T0 - FM31PC000000001

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

RECORDING SYSTEM (continued)

DFDRS

The DFDRS records 25 hours of various critical flight parameters via the FDIU from the aircraft system to the Digital Flight Data Recorder (DFDR). These parameters are recorded to fulfill the mandatory requirements of crash recording.



RECORDING SYSTEM - DFDRS

G6B08031 - G10T4T0 - FM31PC000000001

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

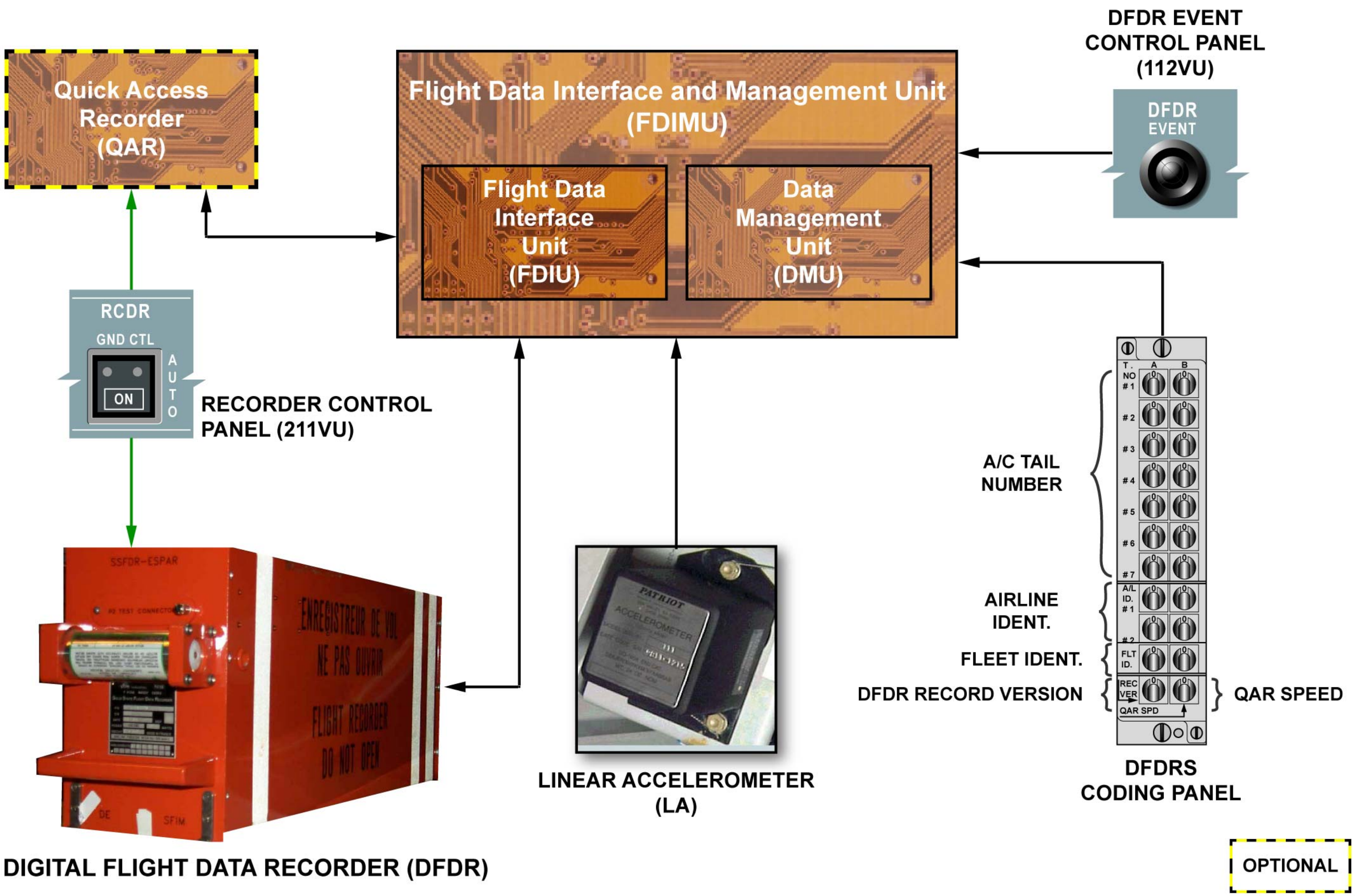
RECORDING SYSTEM (continued)

DFDRS ARCHITECTURE

The DFDRS includes:
- FDIU-part of the FDIMU,
- DFDR,
- Linear Accelerometer (LA),
- DFDR EVENT P/B,
- ReCorDeR GrouND ConTroL P/BSW to meet the minimum requirements,
- Quick Access Recorder (QAR) optionally installed.

The DFDRS coding panel gives to the FDIU identification information such as:
- aircraft tail number,
- airline identification,
- fleet identification,
- DFDR record version,
- and QAR speed.

The aircraft type is given to the FDIU directly by pin programming.



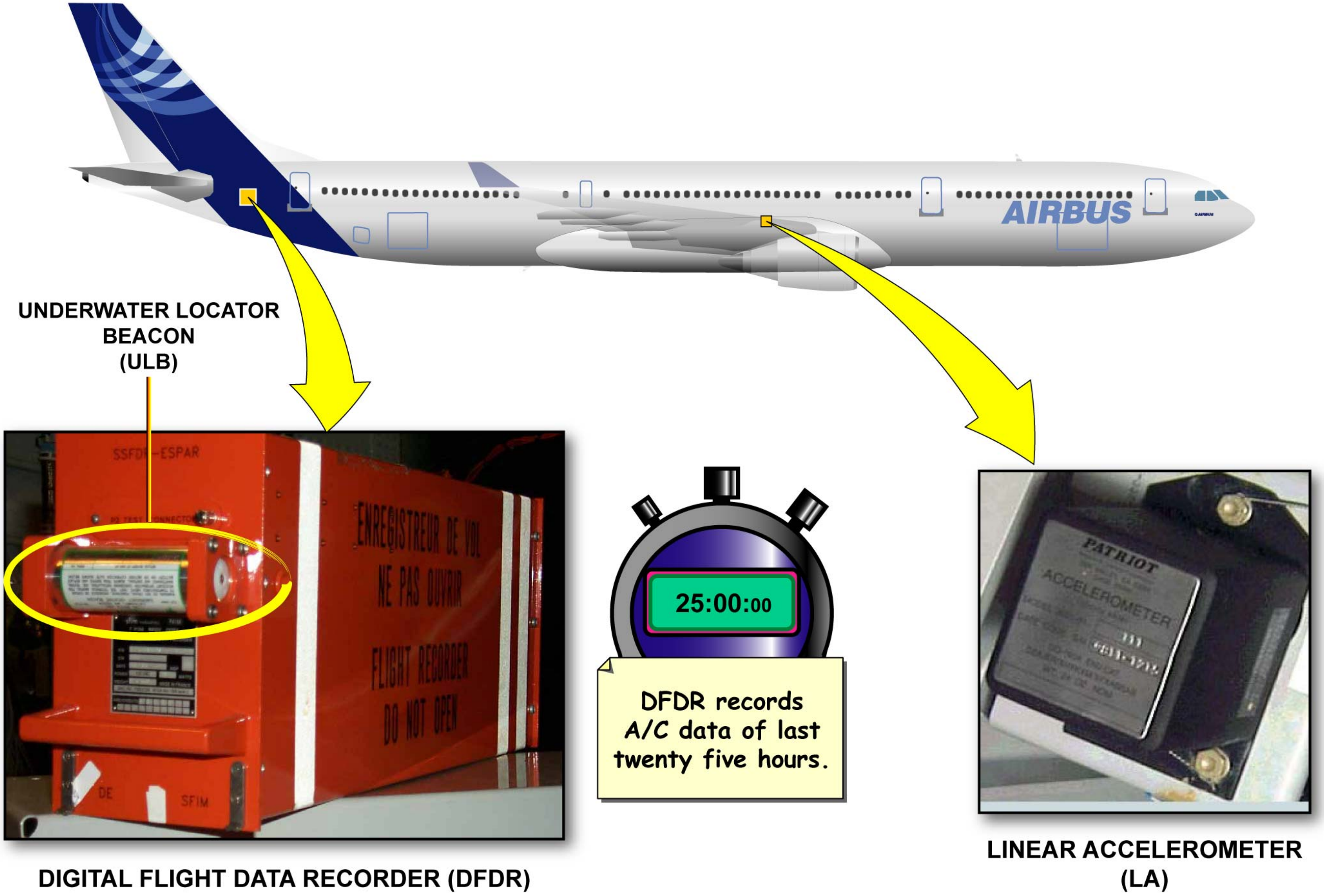
RECORDING SYSTEM - DFDRS ARCHITECTURE

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

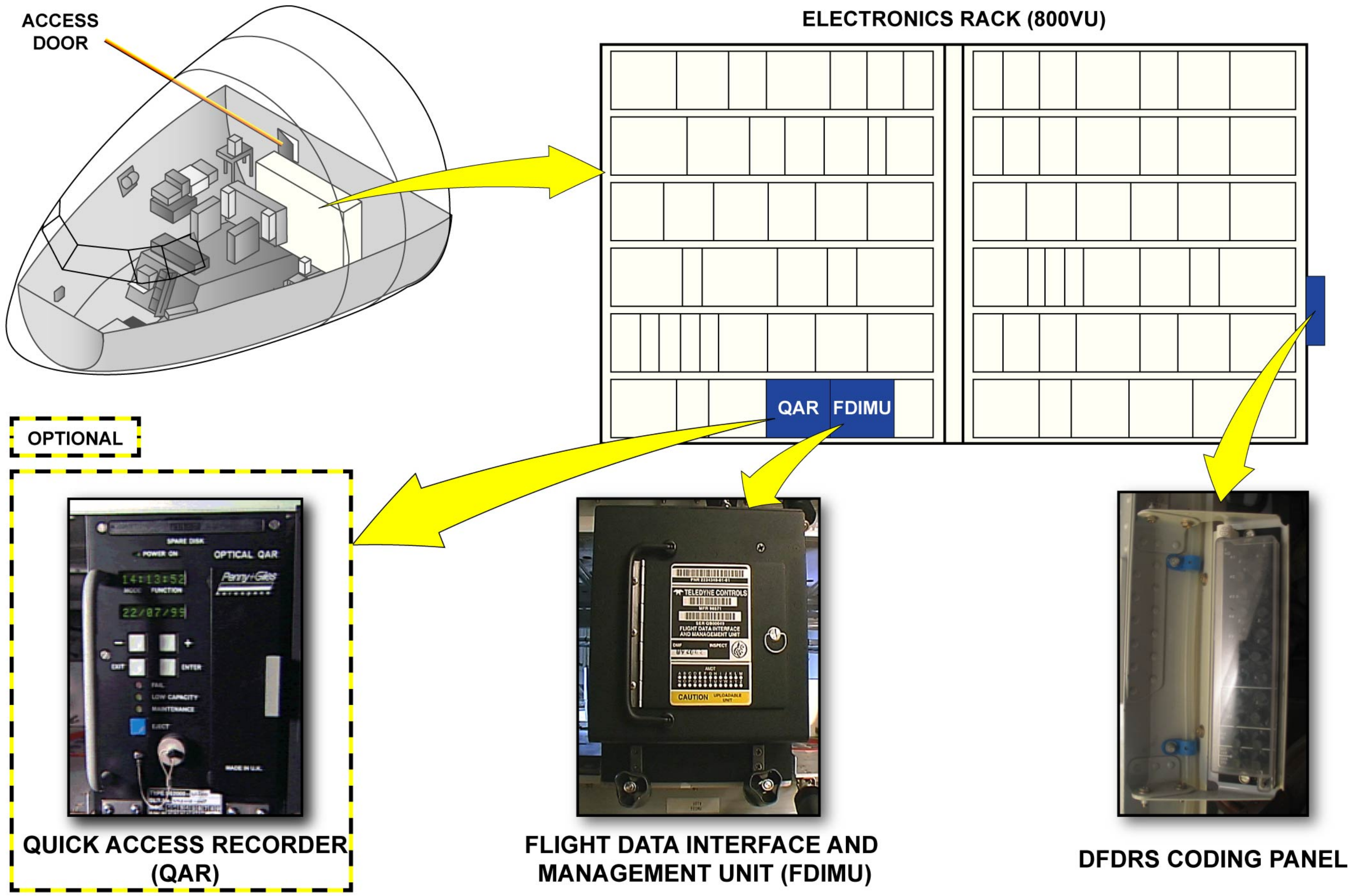
RECORDING SYSTEM (continued)

DFDRS COMPONENT LOCATION

The DFDR is a recorder located in the aft part of the aircraft, which stores in a solid state memory, the data of the last 25 hours collected by the FDIU. The memory board is located in a protected box. The front face of the DFDR includes an Underwater Locator Beacon (ULB) to locate the recorder if the aircraft is immersed in water following an accident. The LA, which measures the acceleration of the aircraft in all three axes, is located in the center of gravity of the aircraft. The DFDR coding panel, the optional QAR and the FDIMU are located in the electronics rack of the avionics bay (800VU).



RECORDING SYSTEM - DFDRS COMPONENT LOCATION



RECORDING SYSTEM - DFDRS COMPONENT LOCATION

G6B08031 - G10T4T0 - FM31PC000000001

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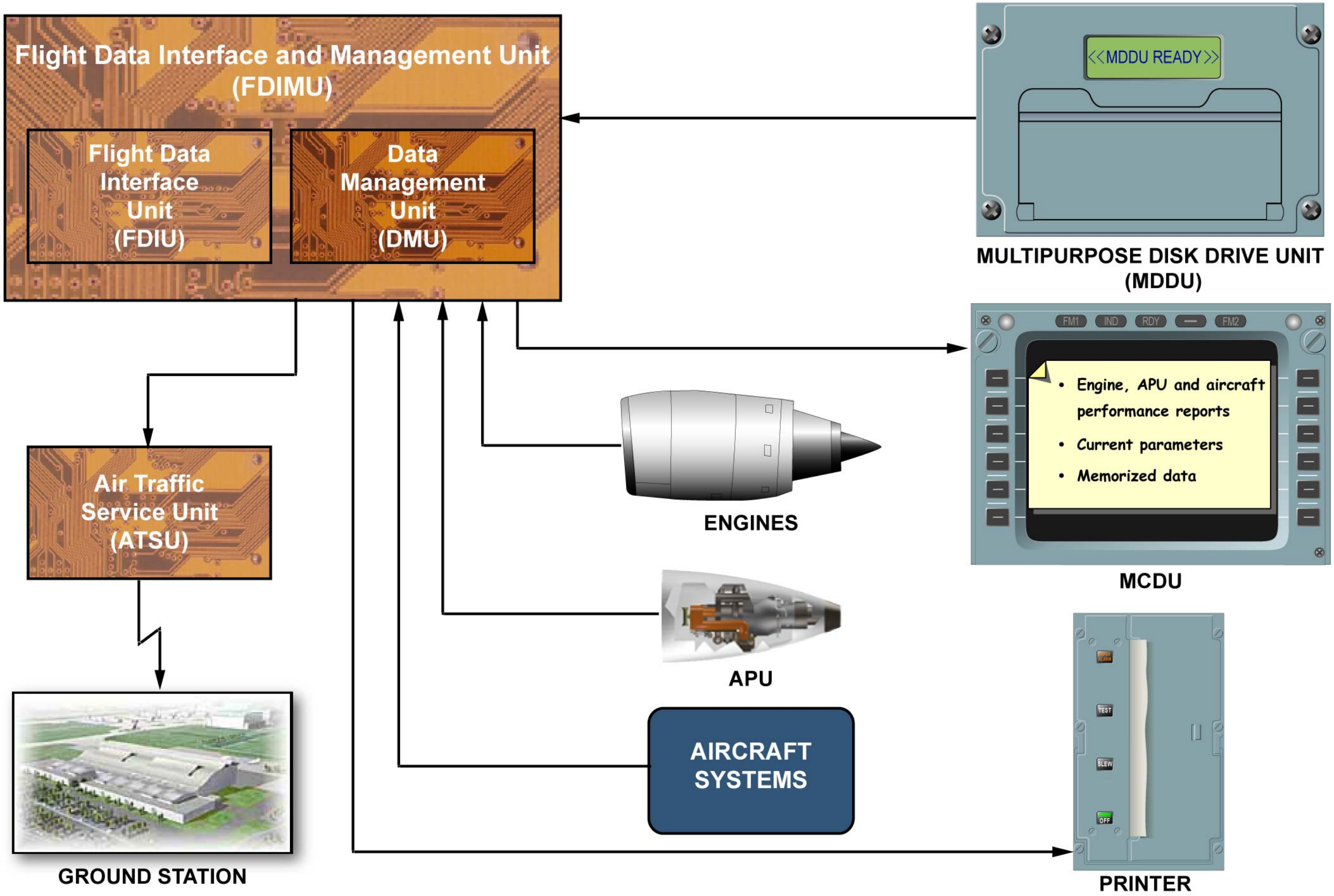
31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

RECORDING SYSTEM (continued)

ACMS

The main functions of the ACMS are to monitor the engine condition, APU condition and aircraft performance, as well as trouble shooting assistance. It collects, records and processes aircraft system data, which can be retrieved and viewed through the MCDU, accessible through removable memory, printed on the aircraft printer, or sent to the ground via the ATSU. Various aircraft systems are connected to the DMU. These input sources give to the DMU engine parameters, APU parameters and aircraft parameters. The Multipurpose Disk Drive Unit (MDDU) is used to upload programmed data into the DMU and to download recorded DMU-part data on a floppy disk for on-ground analysis.



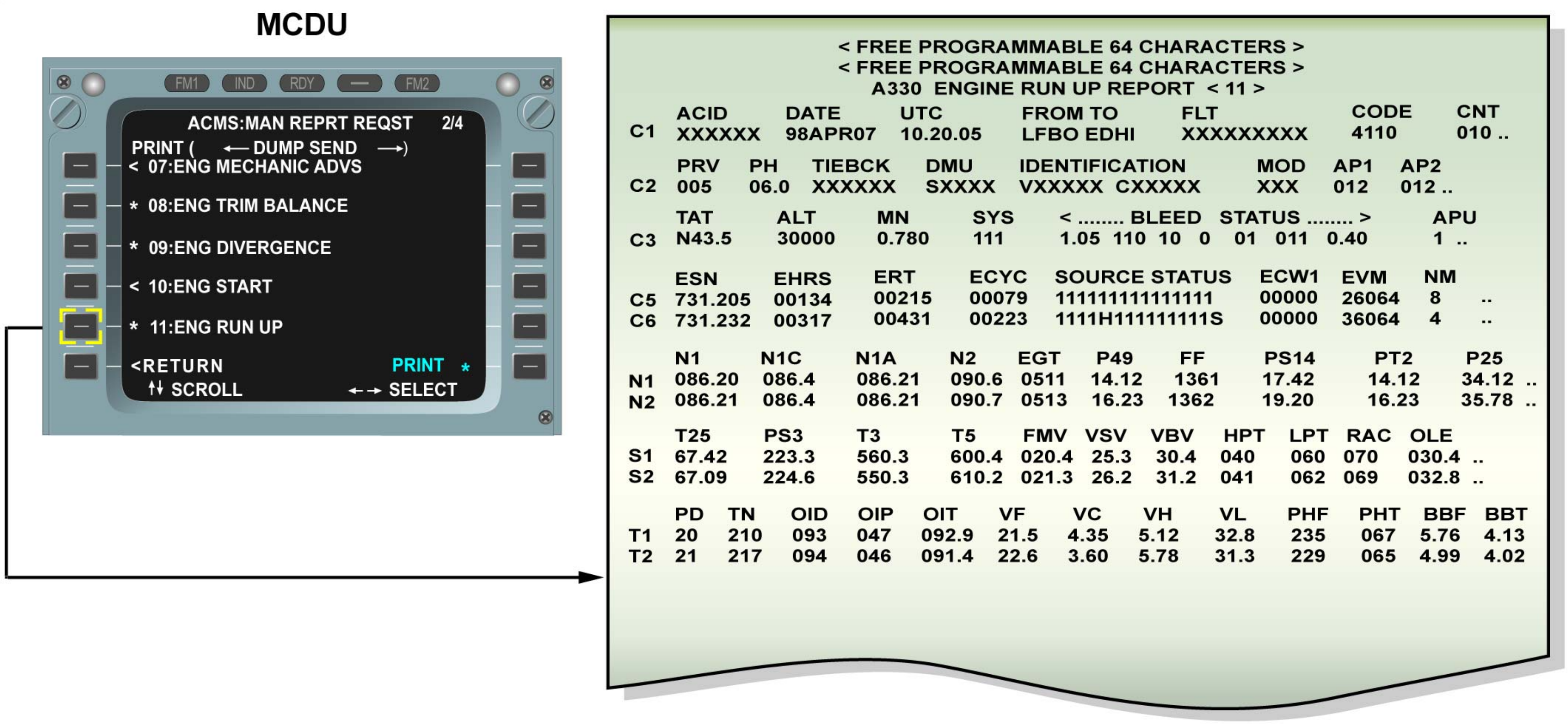
RECORDING SYSTEM - ACMS

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

RECORDING SYSTEM (continued)

ACMS REPORTS

The ACMS reports can be manually or automatically generated. Automatic reports are triggered and generated when specific conditions are met. All the reports can be printed from the MCDU.



This print is provided as an A330 example. The philosophy is identical for the A340.

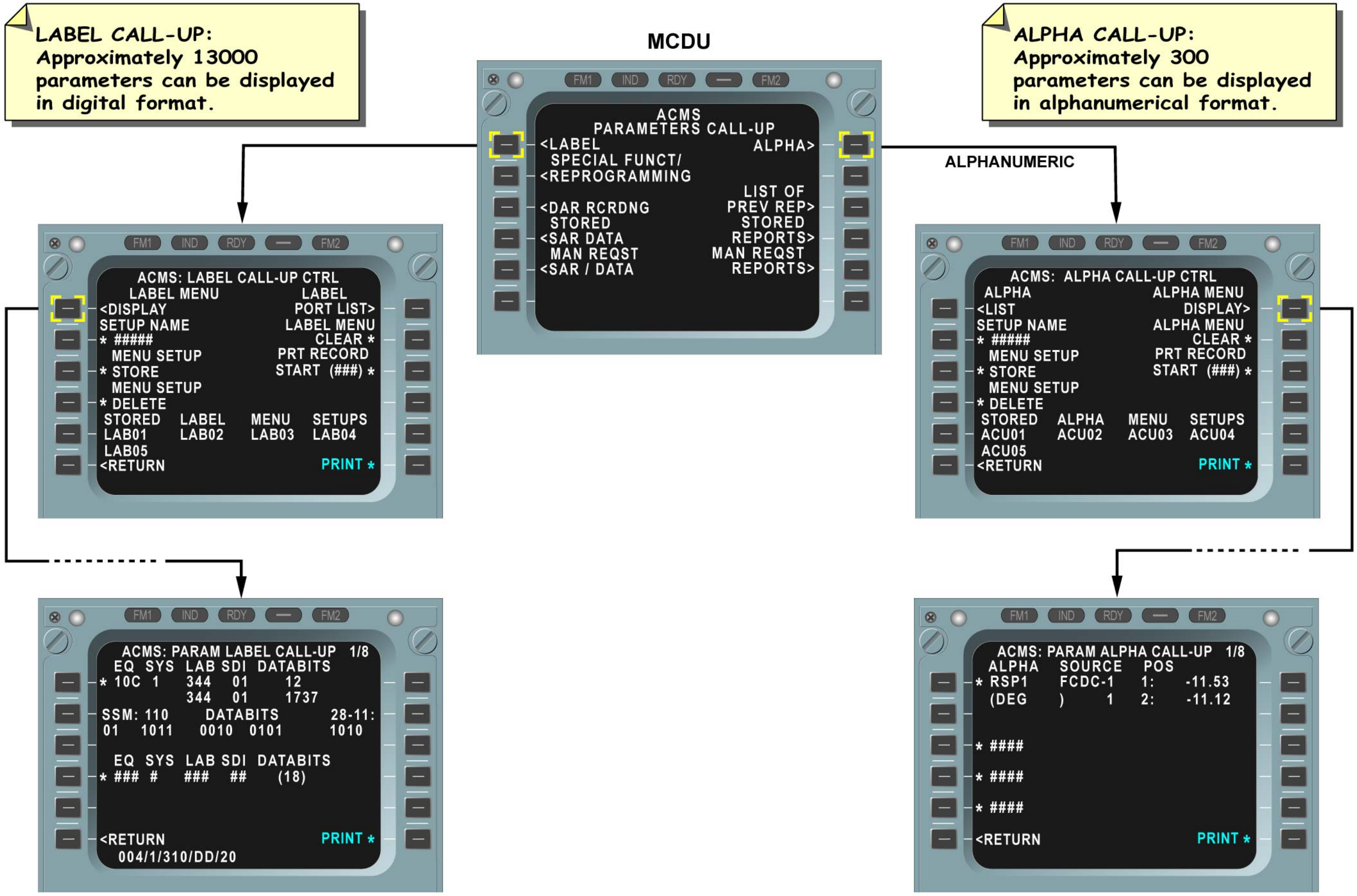
RECORDING SYSTEM - ACMS REPORTS

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

RECORDING SYSTEM (continued)

ALPHA AND LABEL CALL-UP

A selection among 300 aircraft parameters, which have an alphanumeric code, is possible by the alpha call-up function of the MCDU. The ALPHA CALL-UP CTRL page displays alpha call-ups and the definition of alpha call-up sets, which can be recalled at a later date. The ACMS gives direct access to all transmitted parameters connected to the DMU function for the on line display. The ACMS LABEL CALL-UP CTRL page gives the access to the display of label call-ups and the definition of label call-up sets.



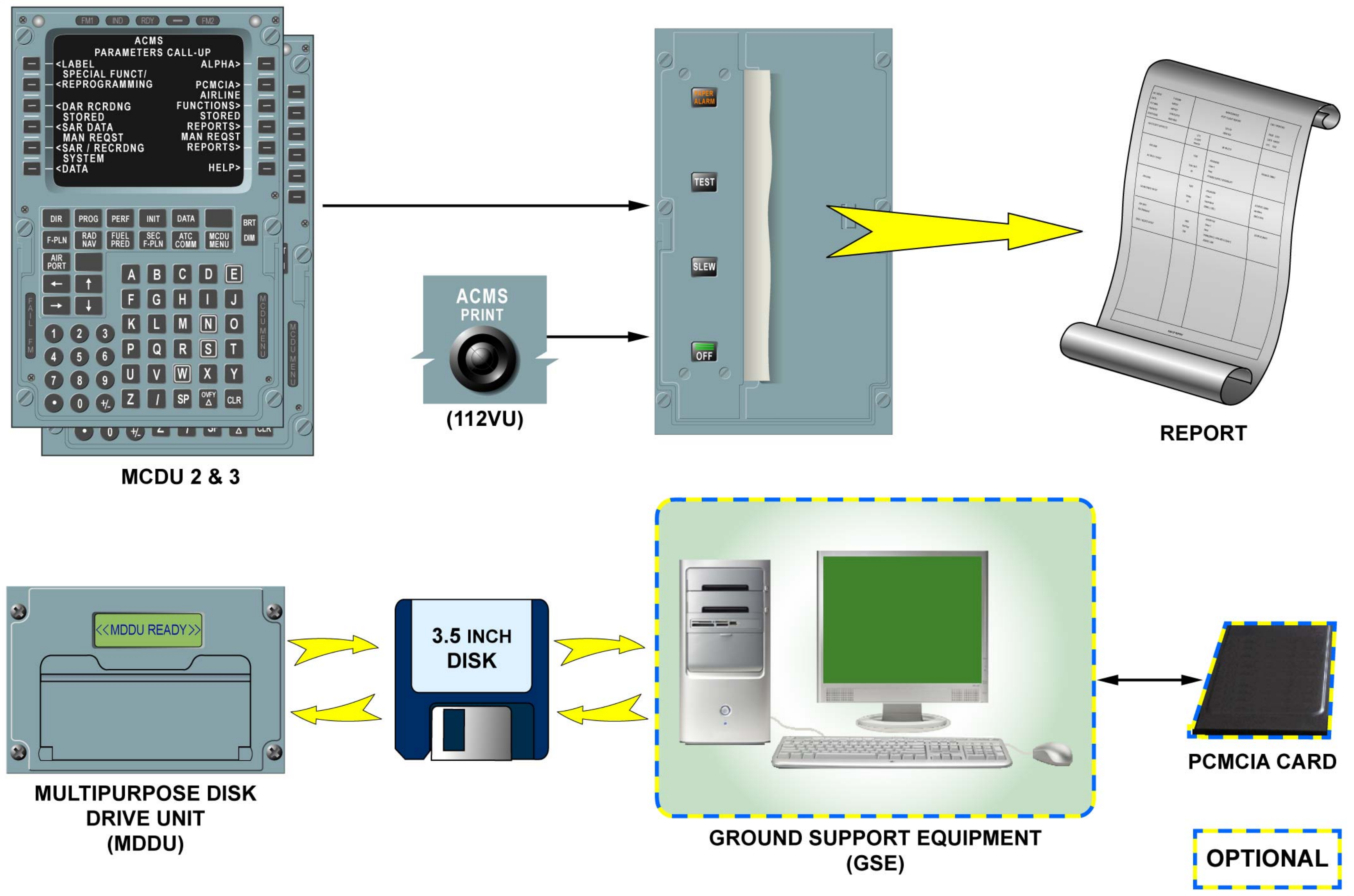
RECORDING SYSTEM - ALPHA AND LABEL CALL-UP

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

RECORDING SYSTEM (continued)

CONTROL AND INDICATING

Some reports can be printed through the programmable ACMS PRINT P/B located on the pedestal. MCDU 2 and 3, one at a time only, are linked to the ACMS for various control and reprogramming menu. An optional Ground Support Equipment (GSE) lets the floppy disk and PCMCIA memory card be read by the operator. The GSE also allows ACMS reconfiguration via the MDDU or the PCMCIA card.



RECORDING SYSTEM - CONTROL AND INDICATING

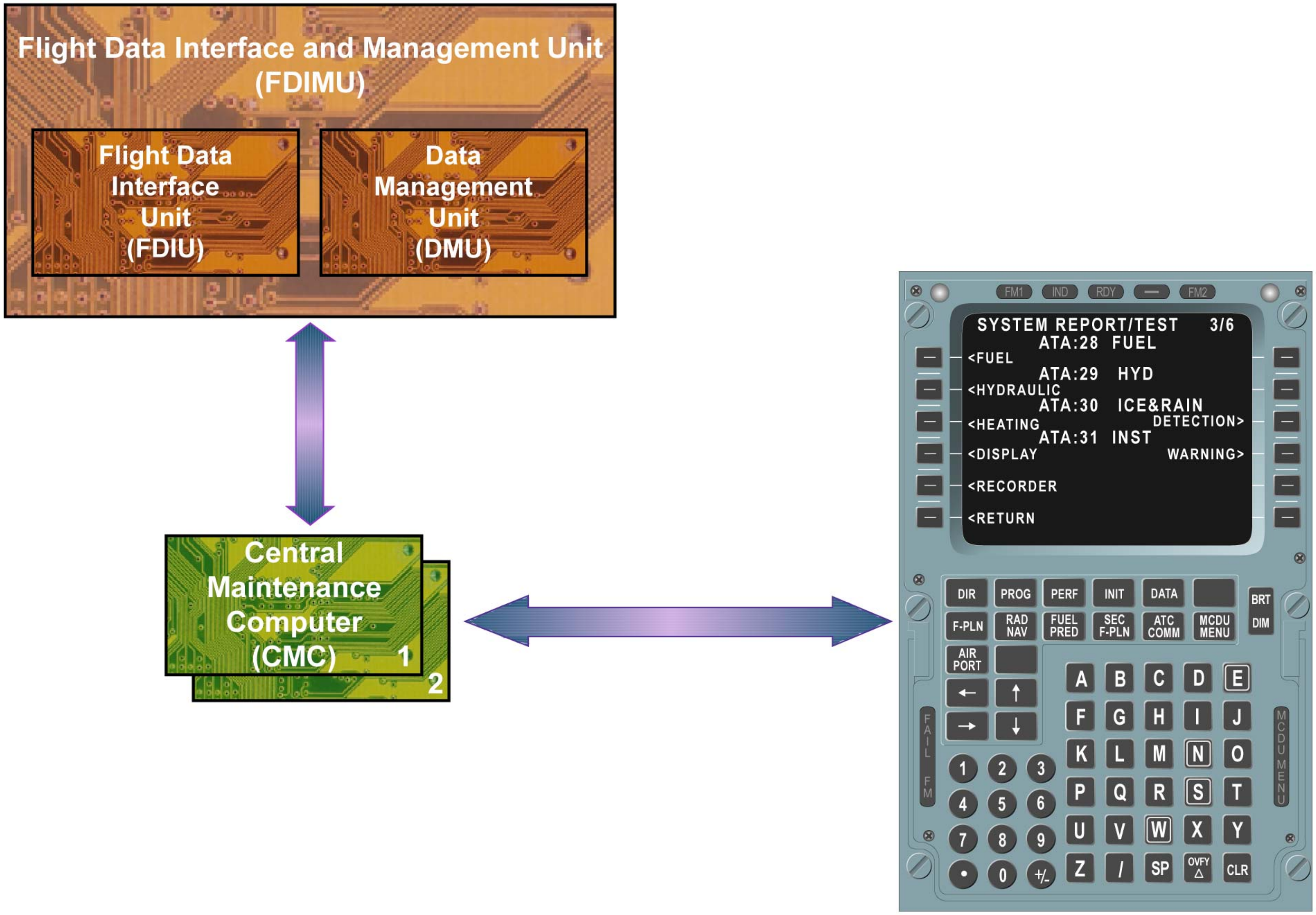
G6B08031 - G10T4T0 - FM31PC000000001

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

RECORDING SYSTEM (continued)

MAINTENANCE/TEST FACILITIES

The recording functions of the DFDRS and the ACMS have their own BITE. The BITE information and test results from the recording systems are transmitted to the CMCs. They are available via the SYSTEM REPORT/TEST page of the MCDU.



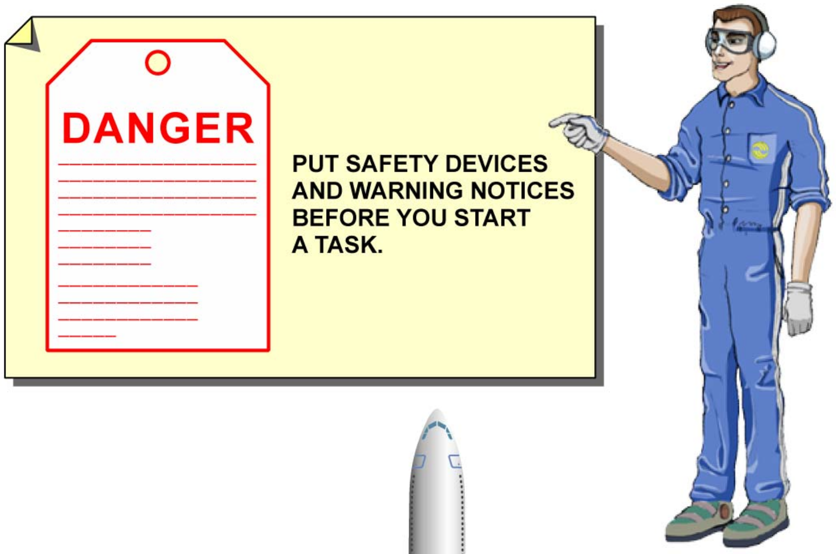
RECORDING SYSTEM - MAINTENANCE/TEST FACILITIES

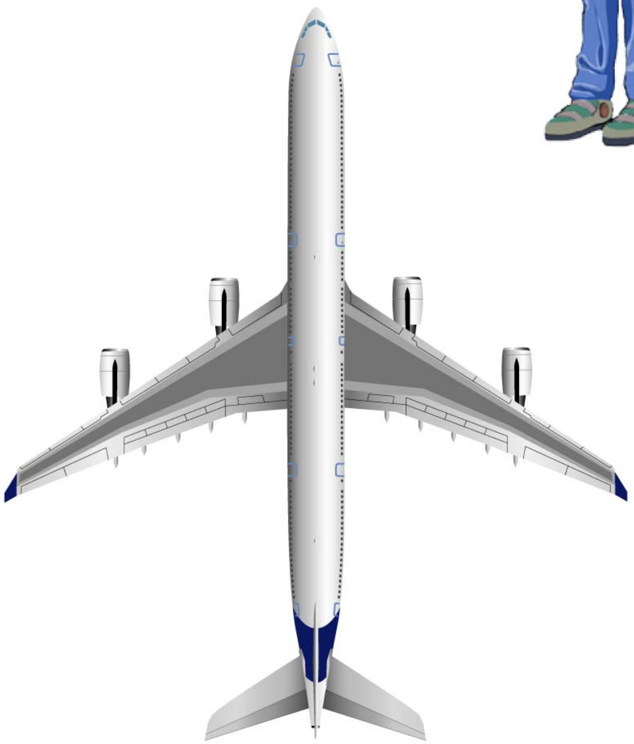
G6B08031 - G10T4T0 - FM31PC0000000001

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

For maintenance operations, respect the AMM procedures.





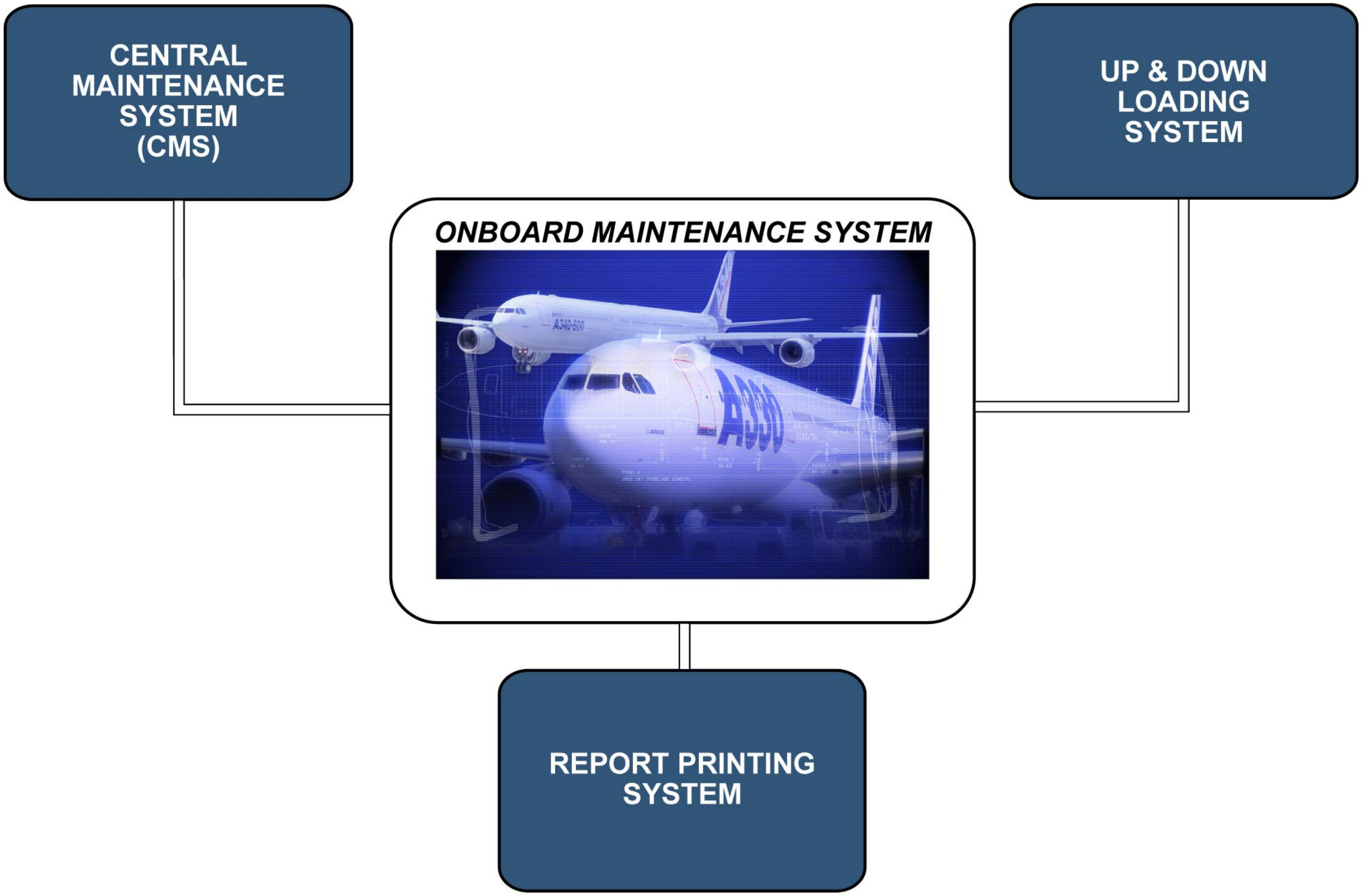
SAFETY PRECAUTIONS

G6B08031 - G10T4T0 - FM31PC000000001

45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

GENERAL

The Onboard Maintenance System (OMS) chapter is divided into:
- the Central Maintenance System (CMS),
- the up and down loading system,
- the report printing system.



G6B08031 - G10T4T0 - FM45P9000000001

GENERAL

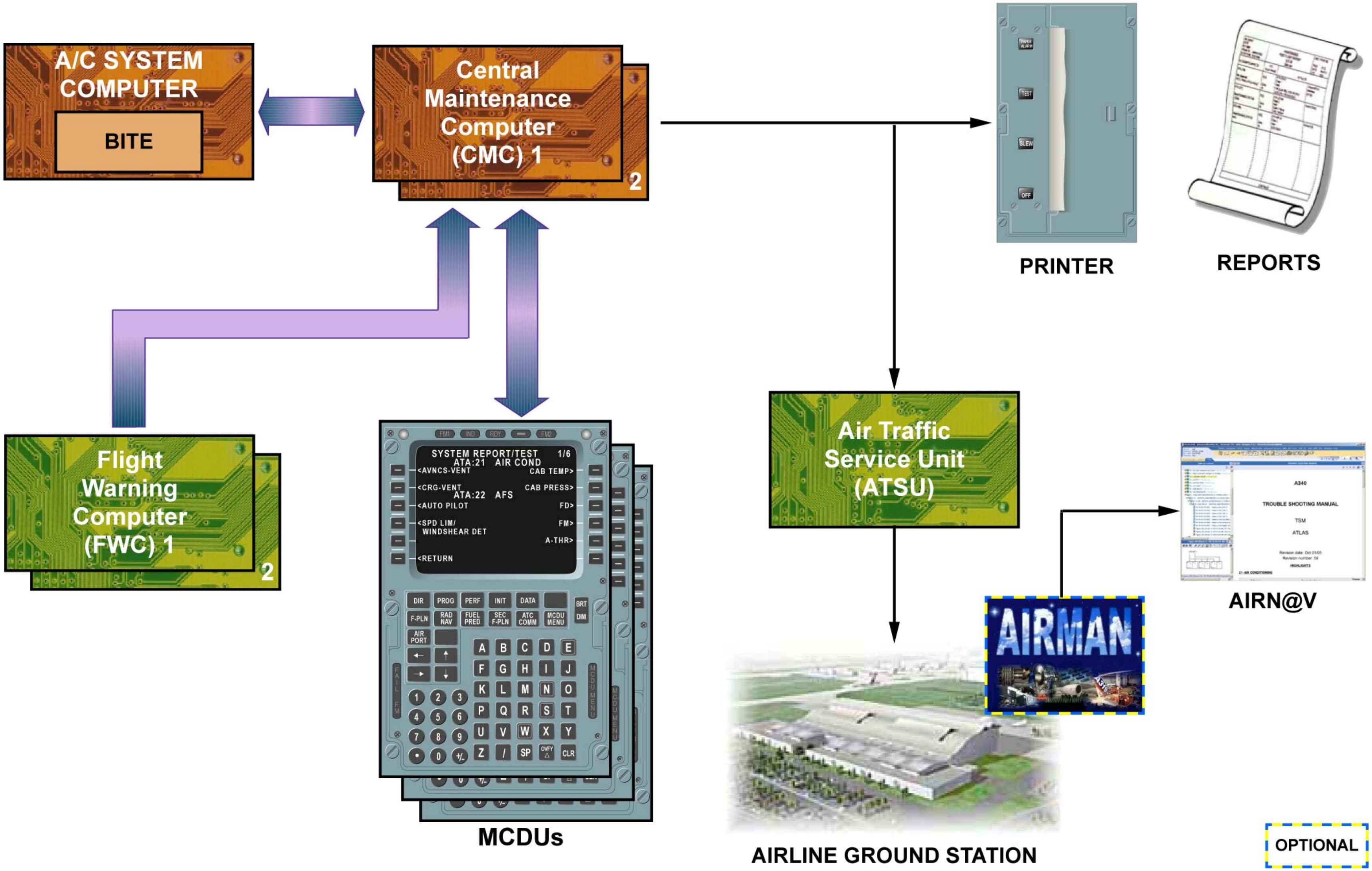
45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

CMS

GENERAL

The Central Maintenance Computers (CMCs) centralize and memorize failure messages produced by the system BITE and warnings generated by the Flight Warning Computers (FWCs). The CMC lets the maintenance personnel make system operational tests, functional checks and read-out of BITE memory through the MCDU. The CMC builds up reports using memorized failures and warnings. These reports can be printed, using the onboard printer, or transmitted to the ground, using the Air Traffic Service Unit (ATSU).
AIRcraft Maintenance ANalysis (AIRMAN), which is an optional ground-based software dedicated to optimize the maintenance of fly-by-wire Airbus aircraft, analyses the following data:
- real time warning and fault messages,
- the Post Flight Report (PFR) at the end of the flight.

AIRMAN gives to each event a link to the Trouble Shooting Manual (TSM) and the related documents. The AirN@v troubleshooting task is reached directly by hyperlinks from the AIRMAN application.


A/C SYSTEM COMPUTER
BITE
Central Maintenance Computer (CMC) 1
2
PRINTER
REPORTS
Flight Warning Computer (FWC) 1
2
SYSTEM REPORT/TEST 1/6
ATA:21 AIR COND
<AVNCS-VENT
CAB TEMP>
<CRG-VENT
CAB PRESS>
ATA:22 AFS
<AUTO PILOT
FD>
<SPD LIM/
WINDSHEAR DET
FM>
A-THR>
<RETURN
MCDUs
Air Traffic Service Unit (ATSU)
AIRMAN
AIRN@V
AIRLINE GROUND STATION
OPTIONAL

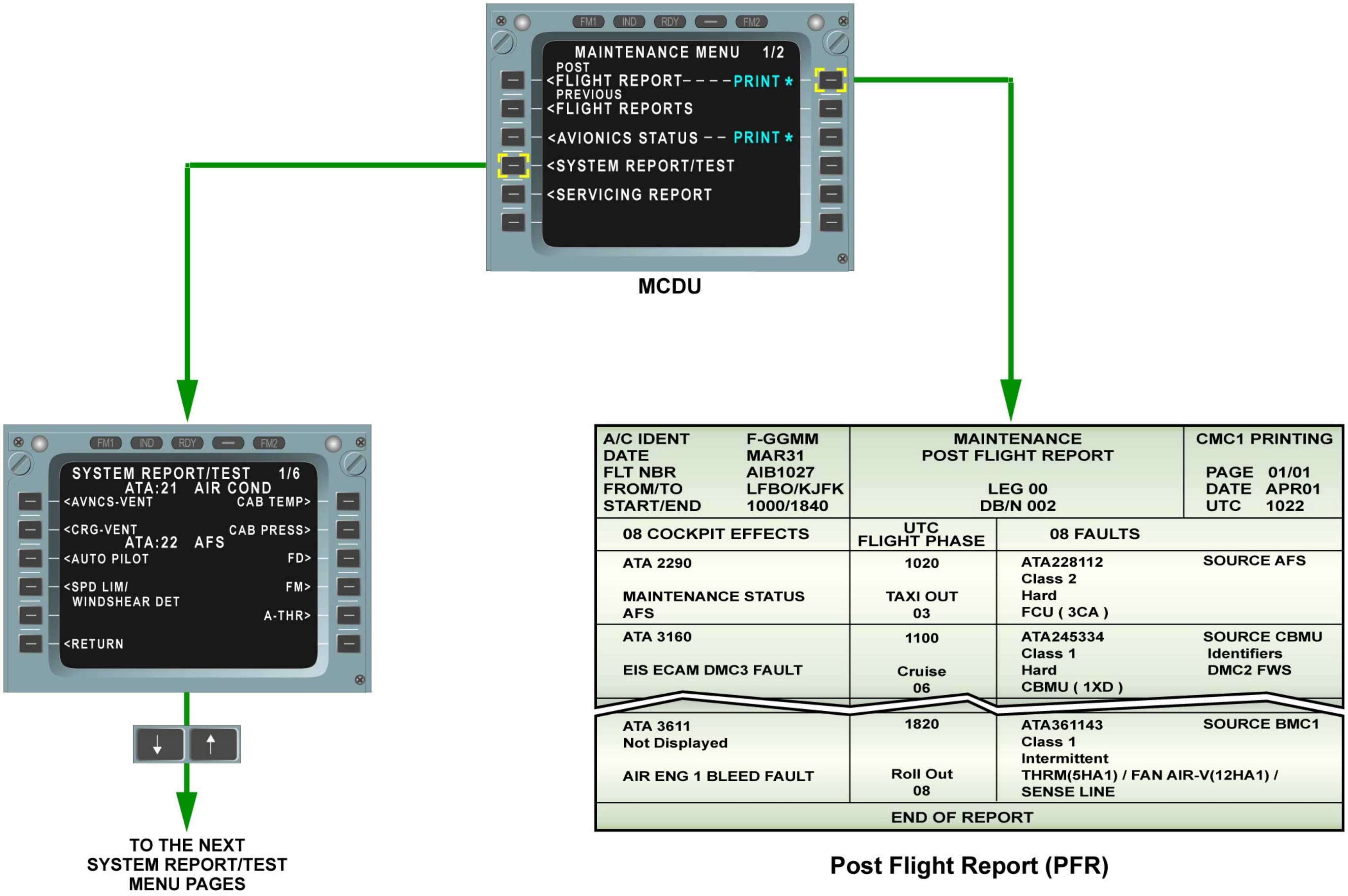
CMS - GENERAL

45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

CMS (continued)

POST FLIGHT REPORT AND SYSTEM REPORT TEST

The failure information is available in various reports. The reading of the failure information is made from two different MCDU menus depending on, if the A/C is in flight or on ground. The SYSTEM REPORT/TEST function is available on ground only. It makes a dialogue between the CMC and a system computer. The SYSTEM REPORT/TEST menu page presents the list of all the systems connected to the CMC, in ATA chapter order.
The maintenance PFR can only be printed on ground. It summarizes and displays the list of the ECAM warning messages and the fault messages, occurred during the last flight, with the related time, flight phase and ATA reference. It helps the maintenance crew to make a correlation for an easier troubleshooting.



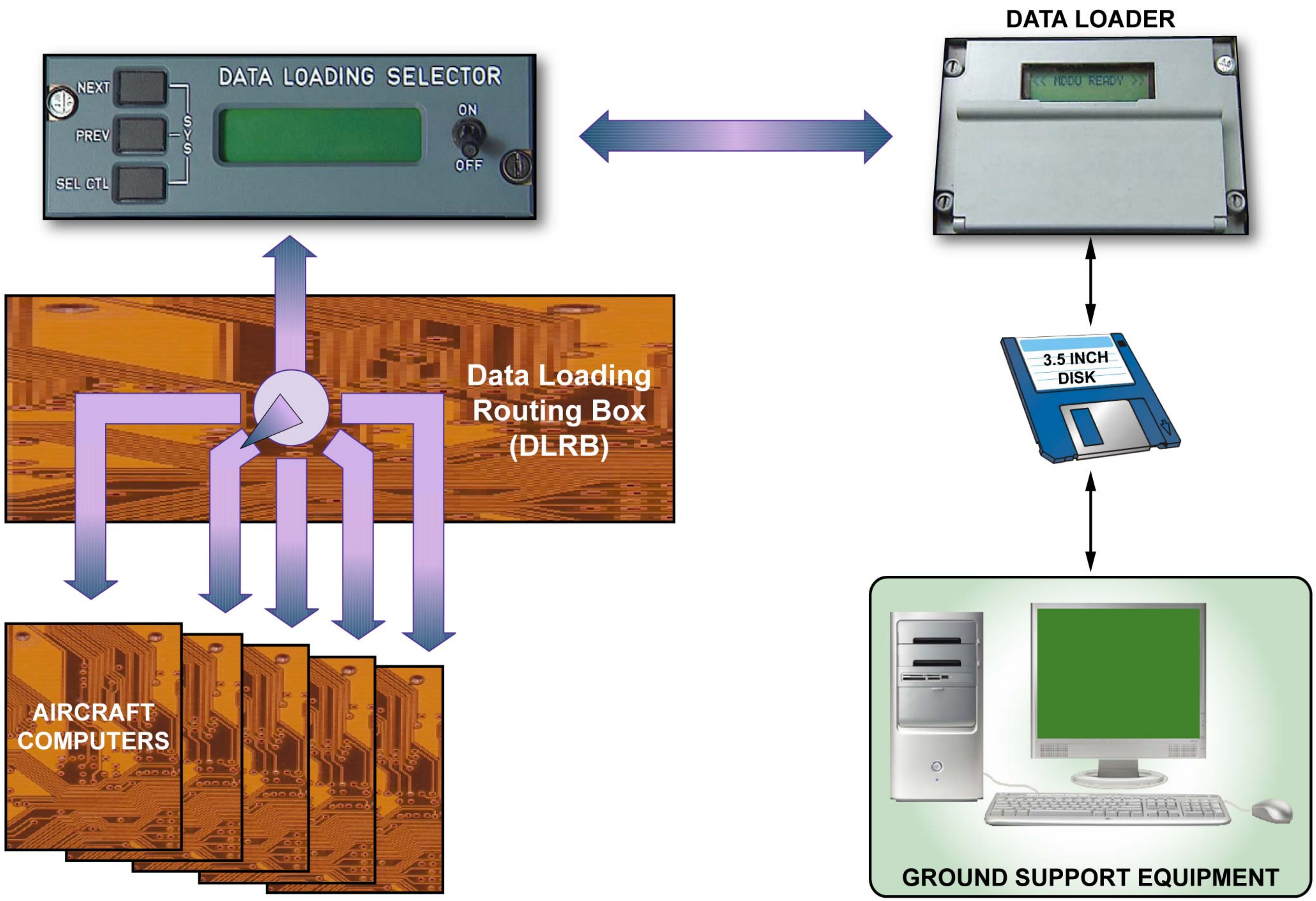
CMS - POST FLIGHT REPORT AND SYSTEM REPORT TEST

G6B08031 - G10T4T0 - FM45P9000000001

45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

UP & DOWN LOADING SYSTEM

The data loading system is an interface between the aircraft computers and the ground support equipment. It is used to update software and databases or to retrieve aircraft system data. The Data Loading Routing Box (DLRB), in accordance with the Data Loading Selector (DLS), makes aircraft computer selection for up and down loading.

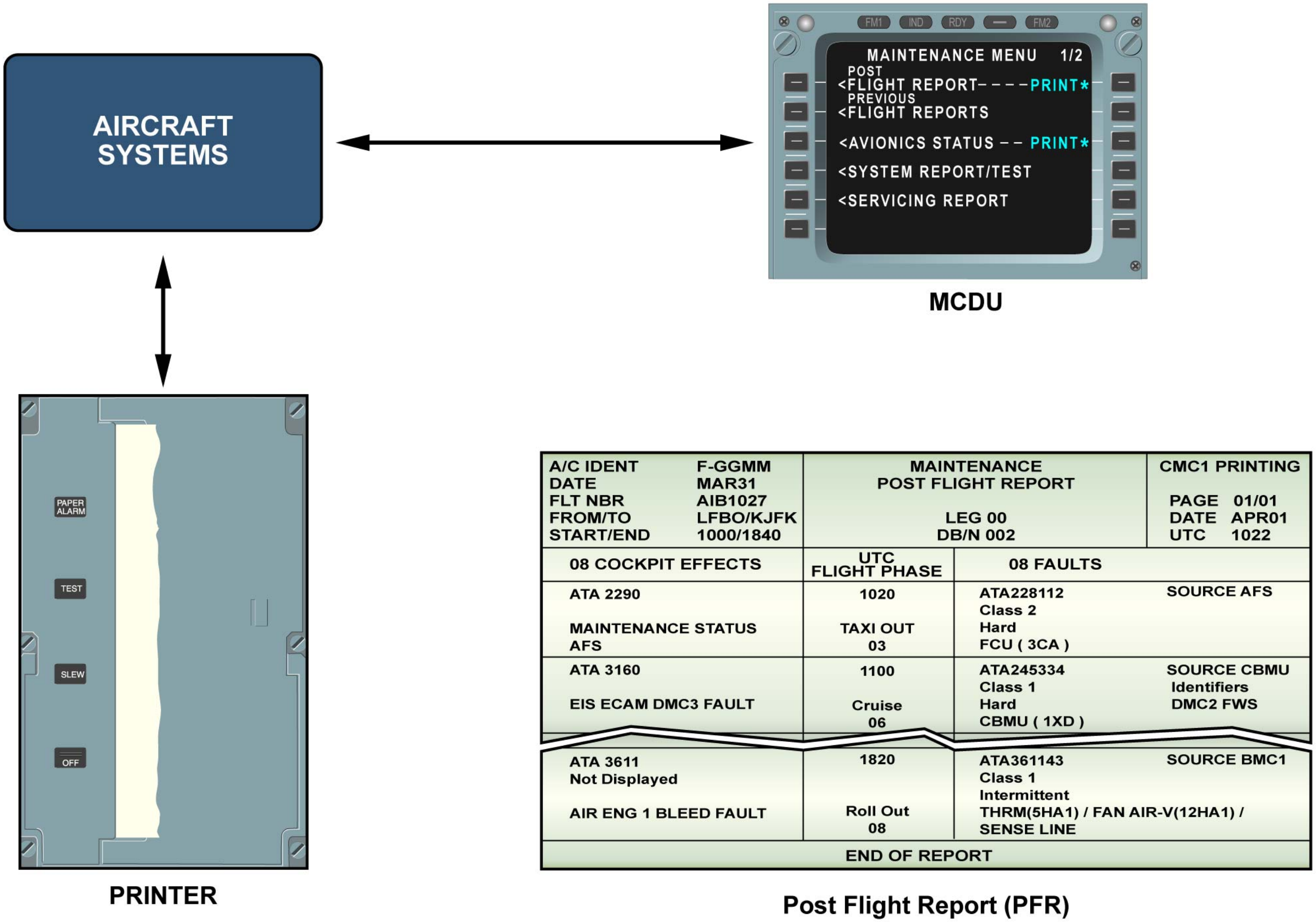


UP & DOWN LOADING SYSTEM

45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

REPORT PRINTING SYSTEM

The printer is used for printing system reports. These systems are:
- the CMS,
- the Aircraft Condition Monitoring System (ACMS),
- the Air Traffic and Information Management System (ATIMS),
- the Flight Management Guidance and Envelope System (FMGES),
- the Engine Interface and Vibration Monitoring Unit (EIVMU).



A/C IDENT F-GGMM DATE MAR31 FLT NBR AIB1027 FROM/TO LFBO/KJFK START/END 1000/1840	MAINTENANCE POST FLIGHT REPORT LEG 00 DB/N 002	CMC1 PRINTING PAGE 01/01 DATE APR01 UTC 1022

08 COCKPIT EFFECTS	UTC FLIGHT PHASE	08 FAULTS	
ATA 2290 MAINTENANCE STATUS AFS	1020 TAXI OUT 03	ATA228112 Class 2 Hard FCU (3CA)	SOURCE AFS
ATA 3160 EIS ECAM DMC3 FAULT	1100 Cruise 06	ATA245334 Class 1 Hard CBMU (1XD)	SOURCE CBMU Identifiers DMC2 FWS
ATA 3611 Not Displayed AIR ENG 1 BLEED FAULT	1820 Roll Out 08	ATA361143 Class 1 Intermittent THRM(5HA1) / FAN AIR-V(12HA1) / SENSE LINE	SOURCE BMC1
END OF REPORT			

REPORT PRINTING SYSTEM

G6B08031 - G10T4T0 - FM45P9000000001

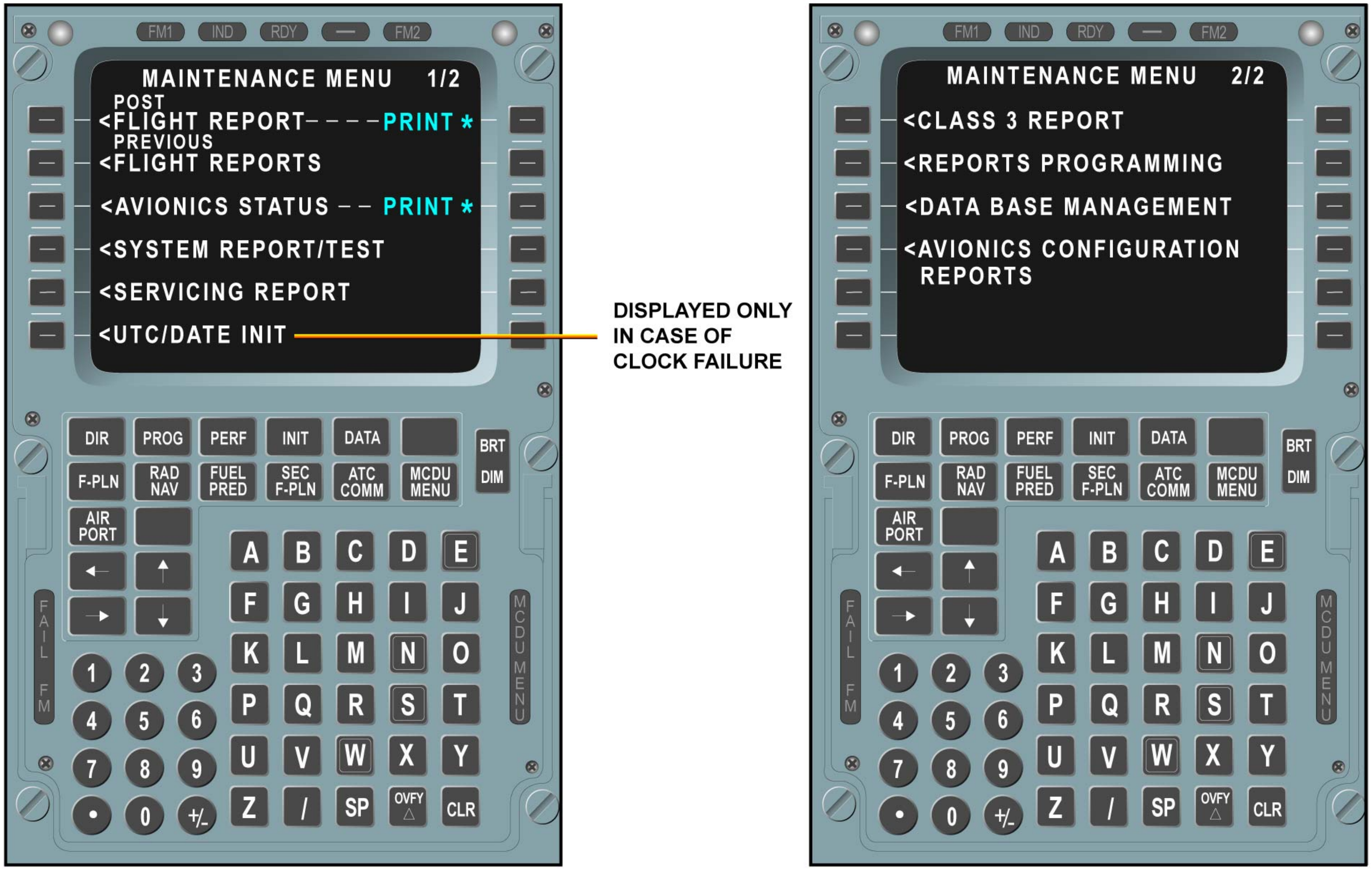
45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

CONTROL THROUGH MCDU

The SYSTEM REPORT/TEST function of the CMS MCDU menu is only available on ground and gives access to the interactive mode.

G6B08031 - G10T4T0 - FM45P9000000001

CMS MENU ON GROUND



CONTROL THROUGH MCDU

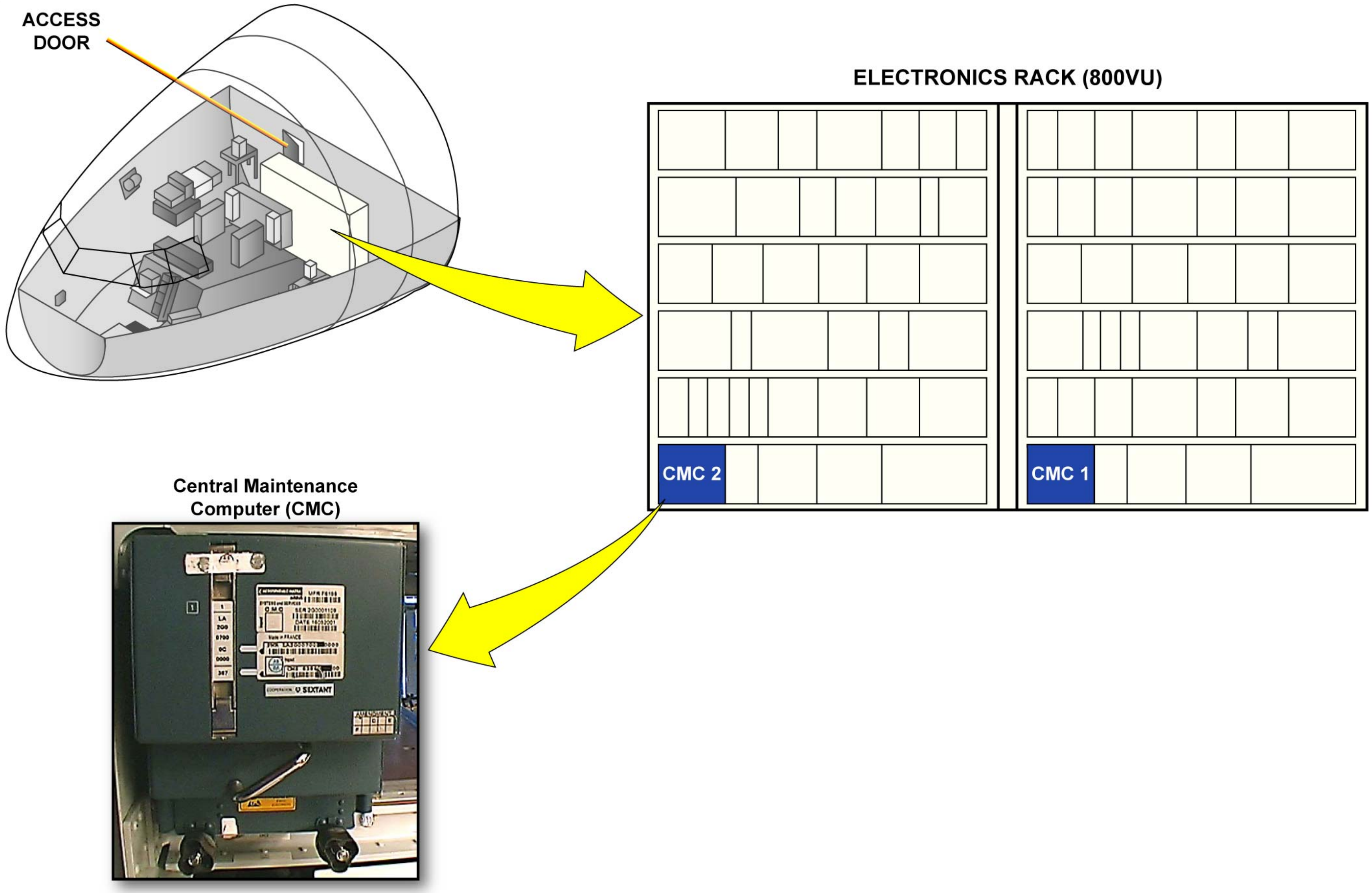
45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

COMPONENTS LOCATION

CMC

The CMS comprises two CMCs. These computers are identical and interchangeable. The two CMCs are located in the main avionics rack (800VU). In normal operation, the CMC 1 is active and the CMC 2 is a hot standby.

G6B08031 - G10T4T0 - FM45P9000000001



COMPONENTS LOCATION - CMC

G6B08031 - G10T4T0 - FM45P9000000001

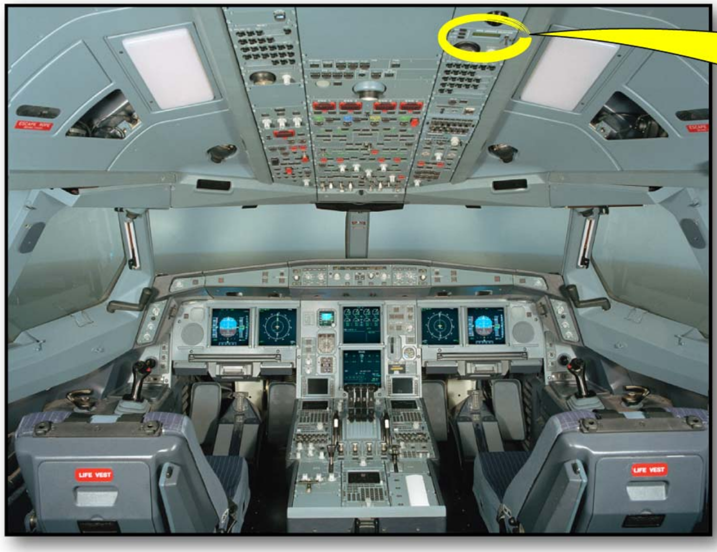
45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

COMPONENTS LOCATION (continued)

DATA LOADER

The data loader, also called Multipurpose Disk Drive Unit (MDDU), is located on the right console in the cockpit. The DLS is located on the overhead panel.
The DLRB is located in the main avionics rack (800VU).

Cockpit view of the A340,
the location is identical on A330 aircraft.

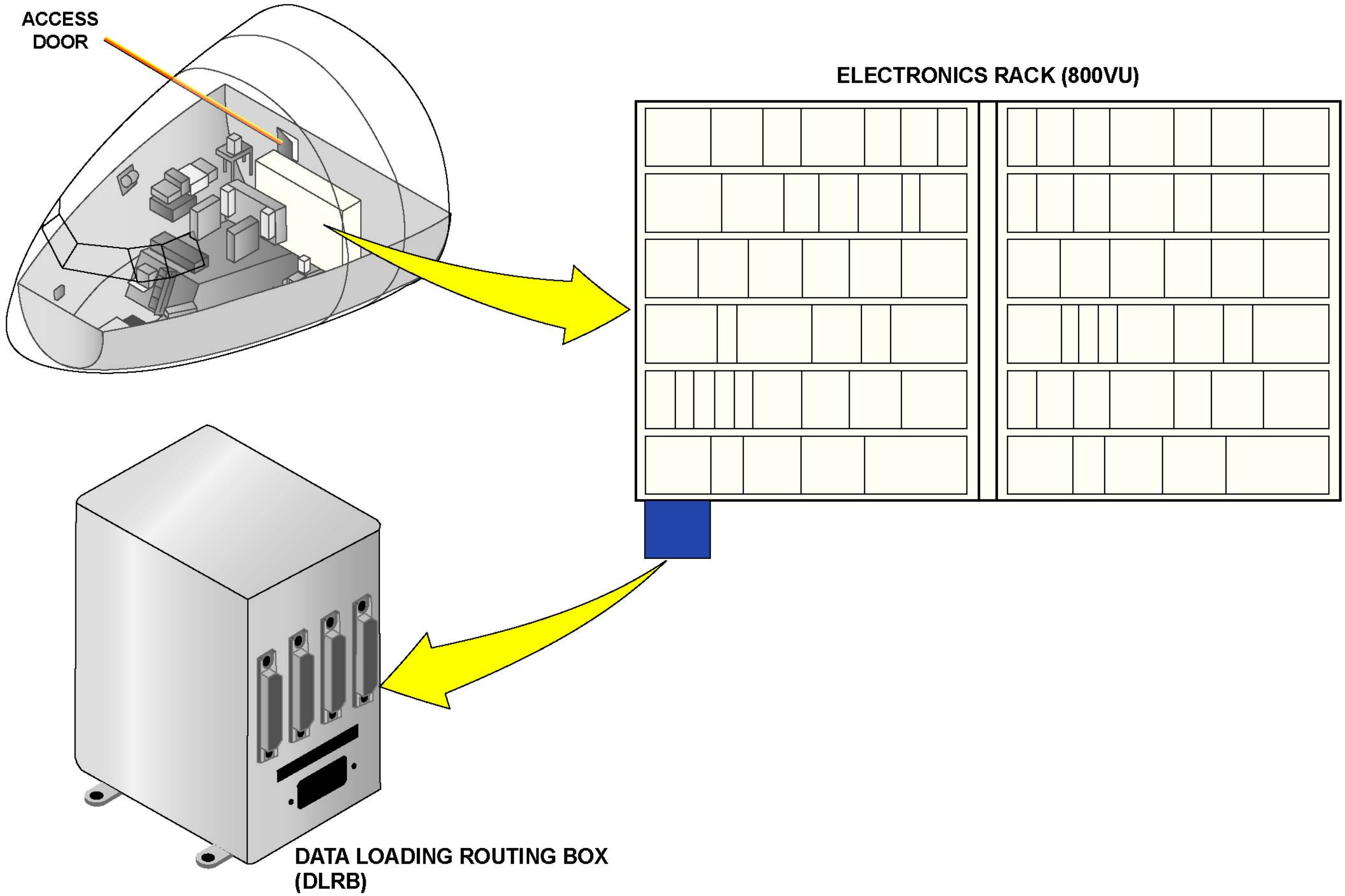


DLS

COCKPIT RIGHT CONSOLE

Multipurpose Disk Drive Unit
(MDDU)

COMPONENTS LOCATION - DATA LOADER



COMPONENTS LOCATION - DATA LOADER

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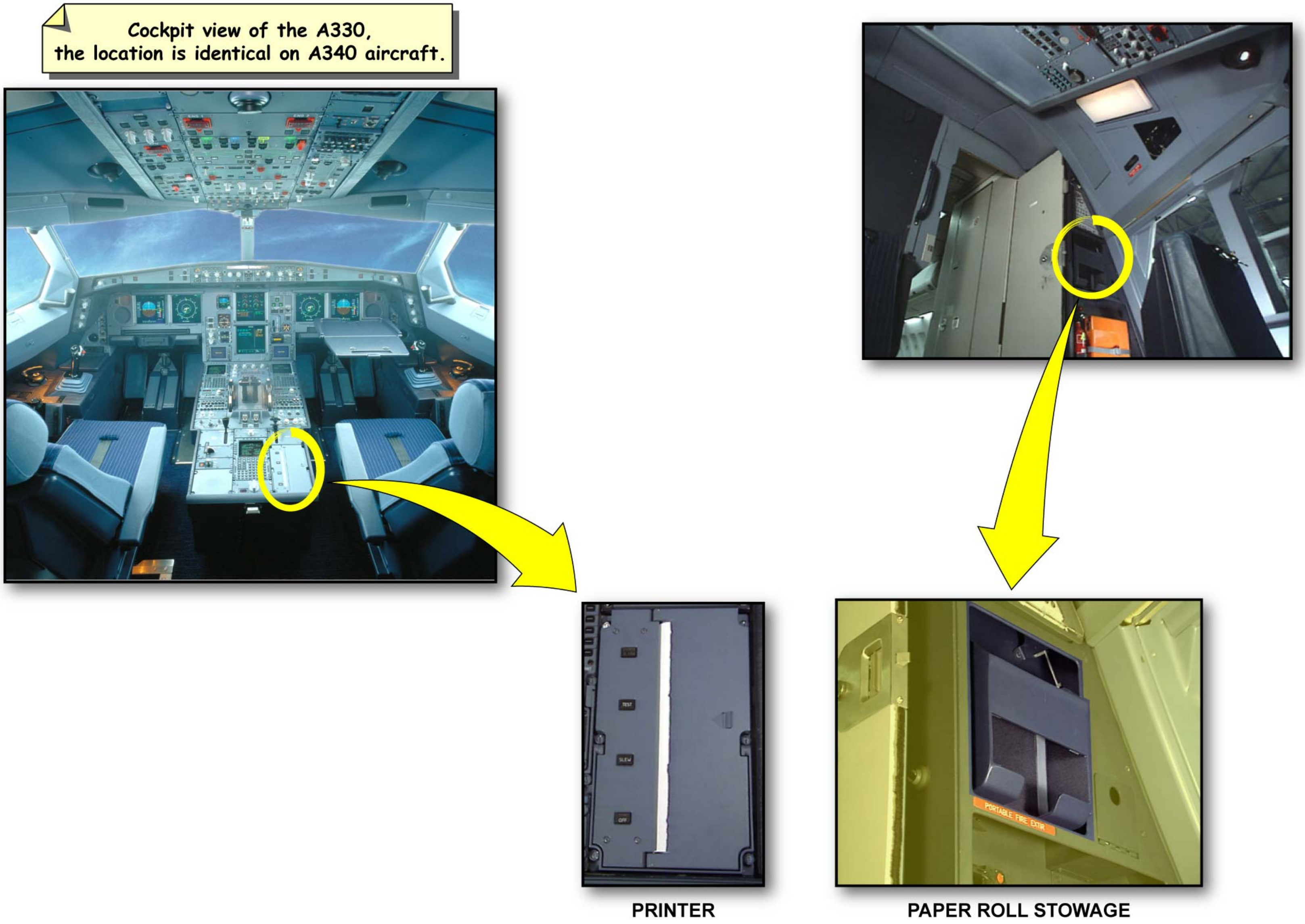
45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

COMPONENTS LOCATION (continued)

PRINTER

The printer is located on the pedestal. Spare paper rolls are stowed in the printer paper-roll box of the cockpit coat stowage. The paper can be inserted via an access door incorporated in the front-panel. The printer is loaded with an 8.5-inch wide (216 mm) paper roll.



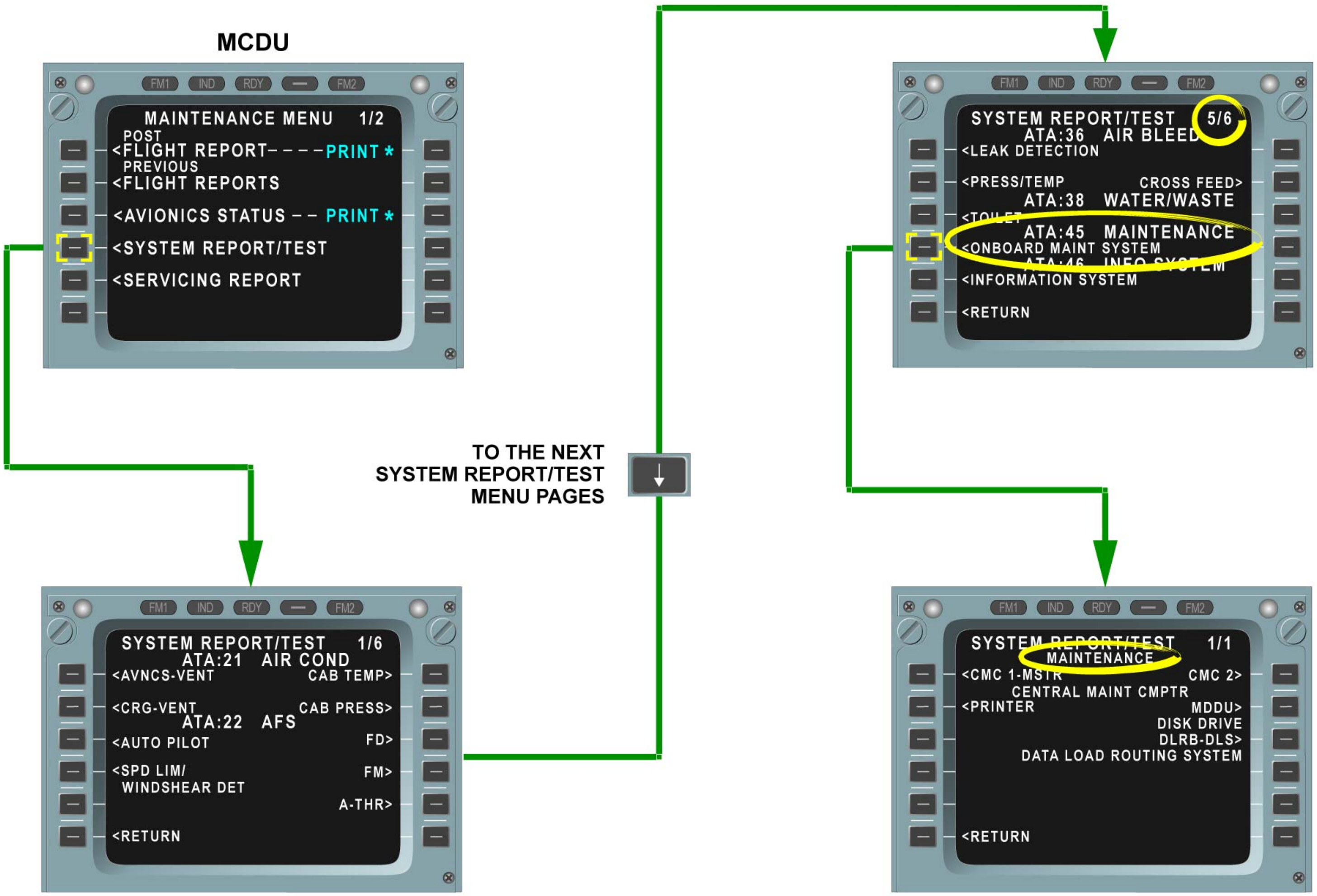
COMPONENTS LOCATION - PRINTER

45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

The BITE of each OMS component (the CMCs, the printer and the up and down loading system) can be interrogated from the SYSTEM REPORT/TEST page of the MCDU.

G6B08031 - G10T4T0 - FM45P9000000001



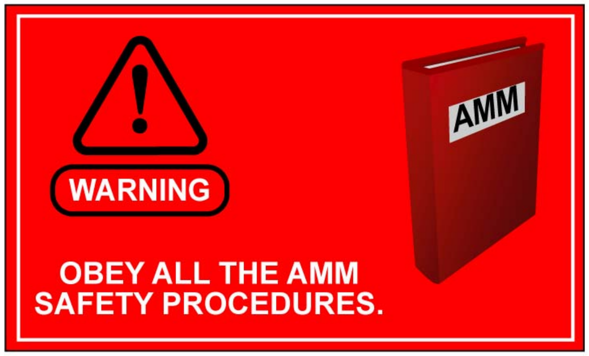
MAINTENANCE/TEST FACILITIES

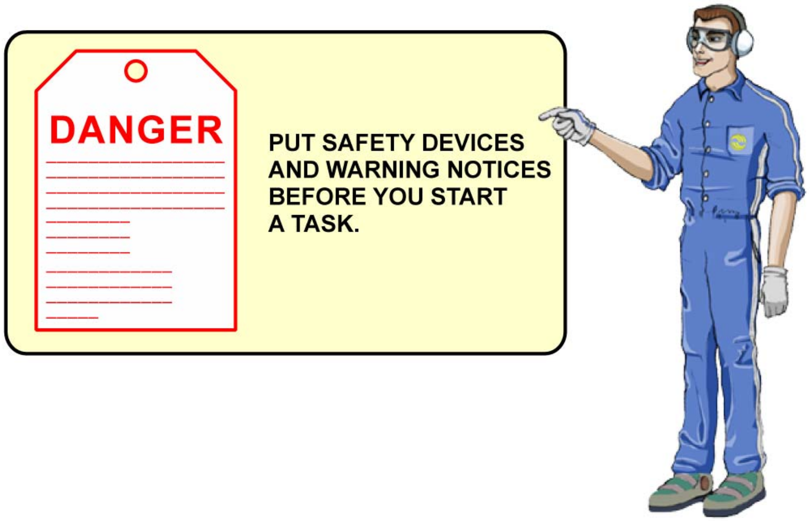
G6B08031 - G10T4T0 - FM45P9000000001

45 ONBOARD MAINTENANCE SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

As it is possible to make operational tests from the CMS when aircraft systems become active, safety precautions must be observed before to proceed these tests.





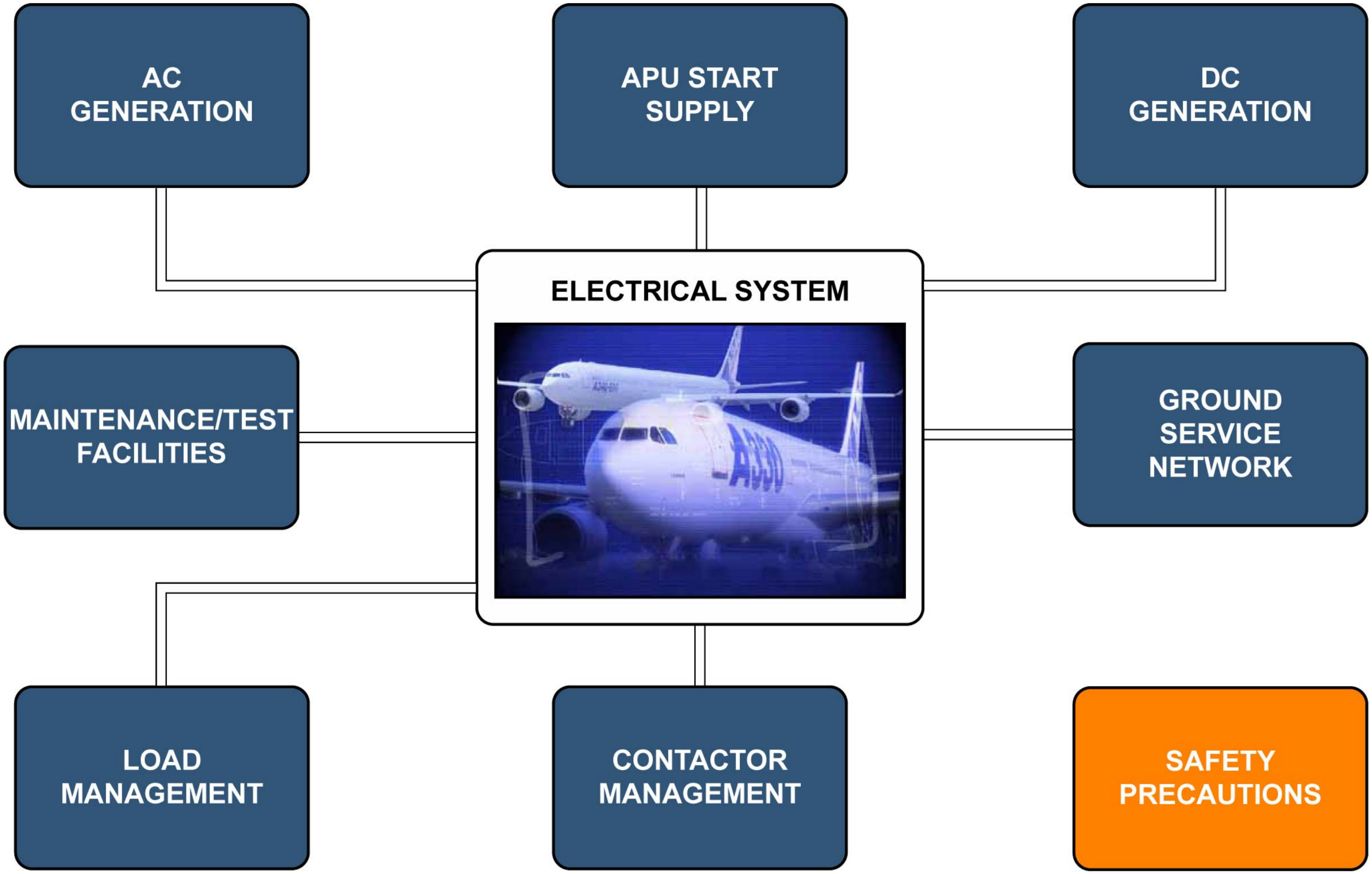
SAFETY PRECAUTIONS

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

GENERAL

The electrical system supplies Alternating Current (AC) and Direct Current (DC) power to the aircraft systems according to the different electrical power sources available. The electrical system has:
- the AC generation,
- the DC generation,
- the APU start supply,
- the ground/service network,
- the contactors management,
- the load management,
- the maintenance/test facilities.

When you work on the electrical system, you must obey all safety precautions listed in the AMM.



GENERAL

G6B08031 - G10T4T0 - FM24P2000000001

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

AC GENERATION

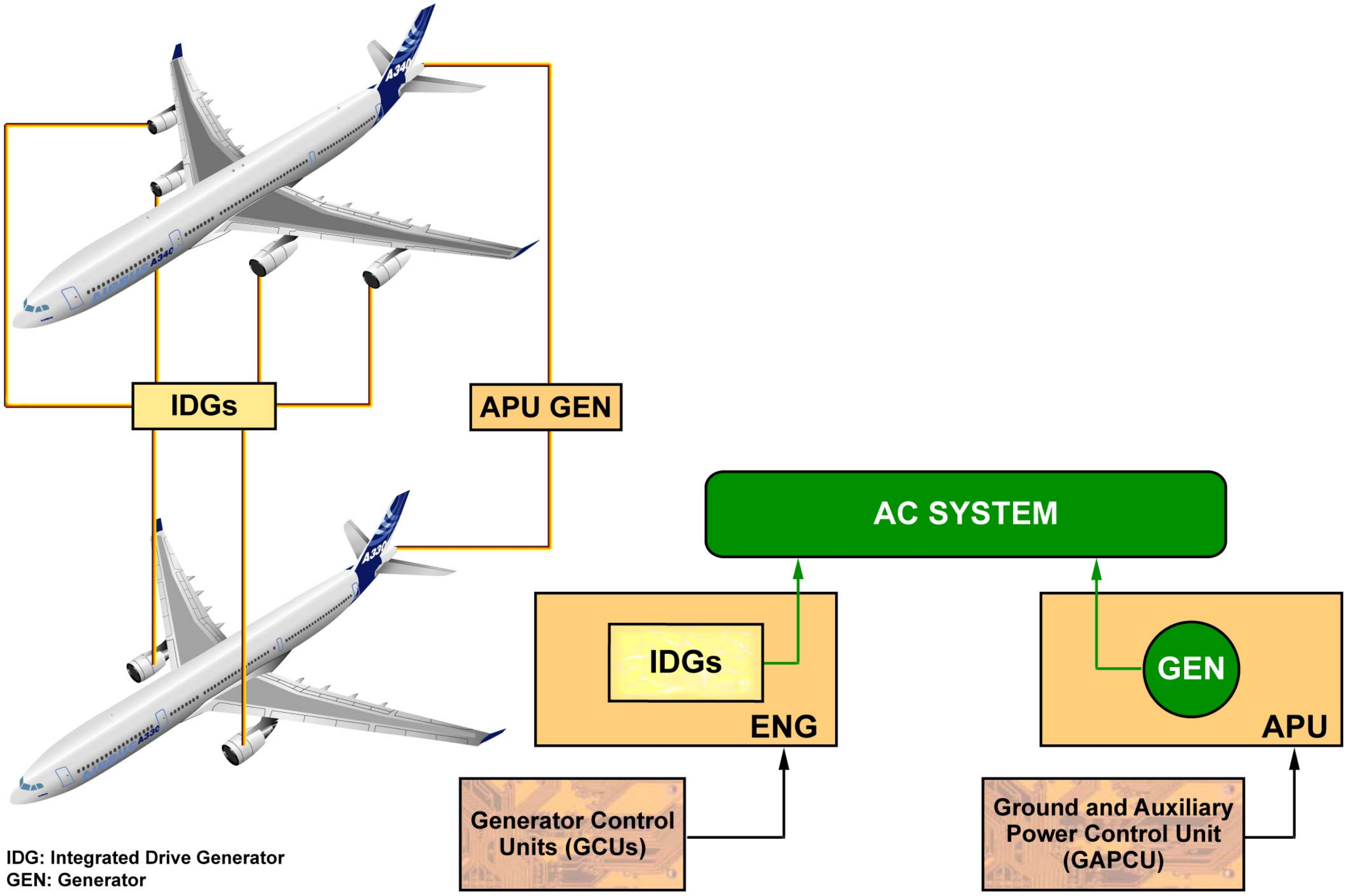
In this topic, we will deal with the different AC electrical power sources.

IDG

In flight the AC electrical system is supplied by engine driven Integrated Drive Generators (IDGs). There is one IDG per engine, installed on the related engine gearbox pad. Each IDG is controlled and monitored by its related Generator Control Unit (GCU).

APU

In flight or on ground, the APU GEN can supply the entire AC electrical system. It is directly driven from the APU gearbox. The APU GEN is controlled and monitored by the APU part of the Ground and Auxiliary Power Control Unit (GAPCU).



AC GENERATION - IDG & APU

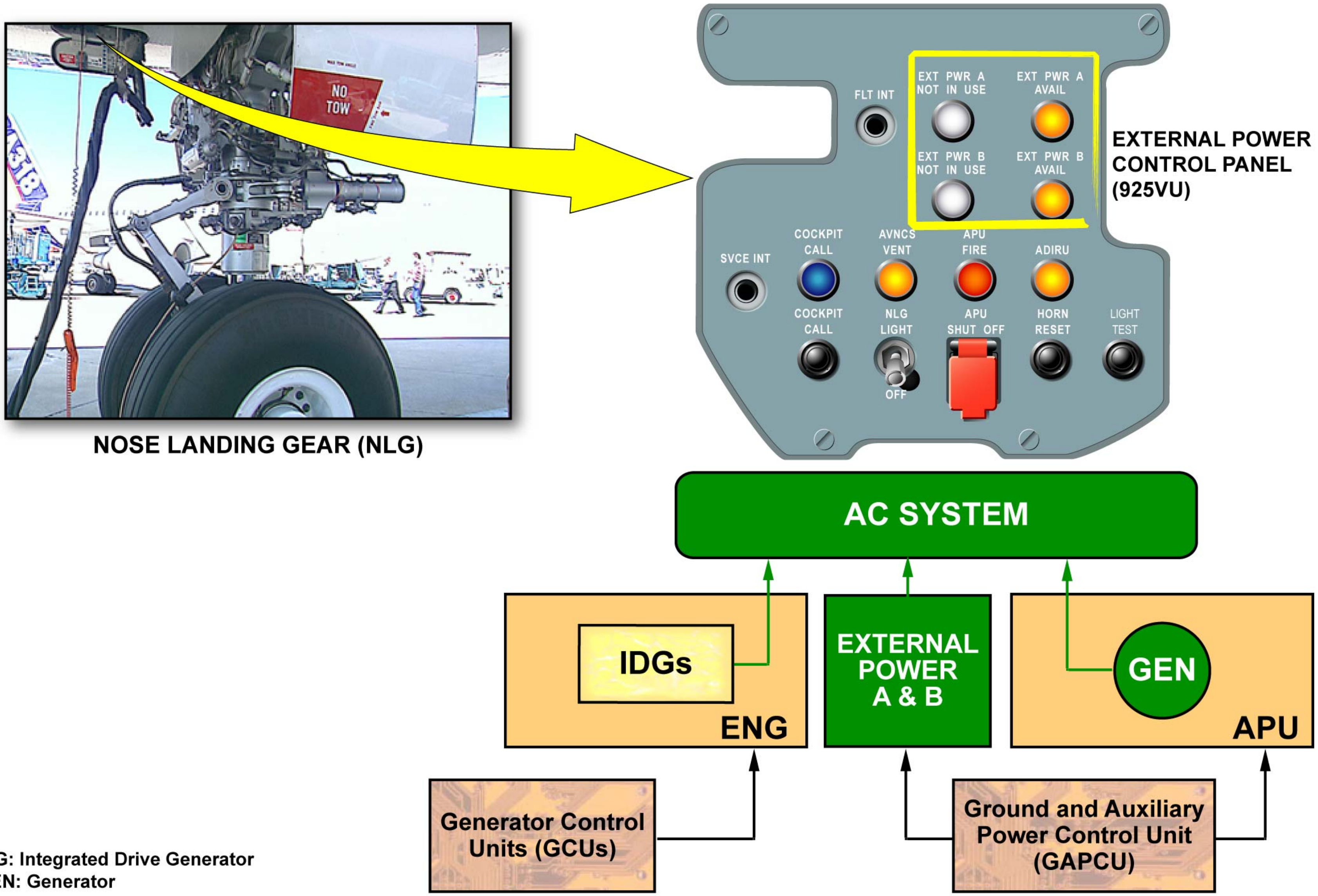
24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

AC GENERATION (continued)

EXTERNAL POWER

On ground, the entire AC electrical system can also be supplied by two external power sources called:
- EXTernal PoWeR A,
- and/or EXT PWR B.

The external power control panel, located aft of the NLG, gives access to the EXT PWR receptacles for connection of the ground power units to the electrical network. The monitoring of the ground power sources availability is made by using colored lights. The EXT PWR parameters are monitored by the external power part of the GAPCU.



IDG: Integrated Drive Generator
GEN: Generator

AC GENERATION - EXTERNAL POWER

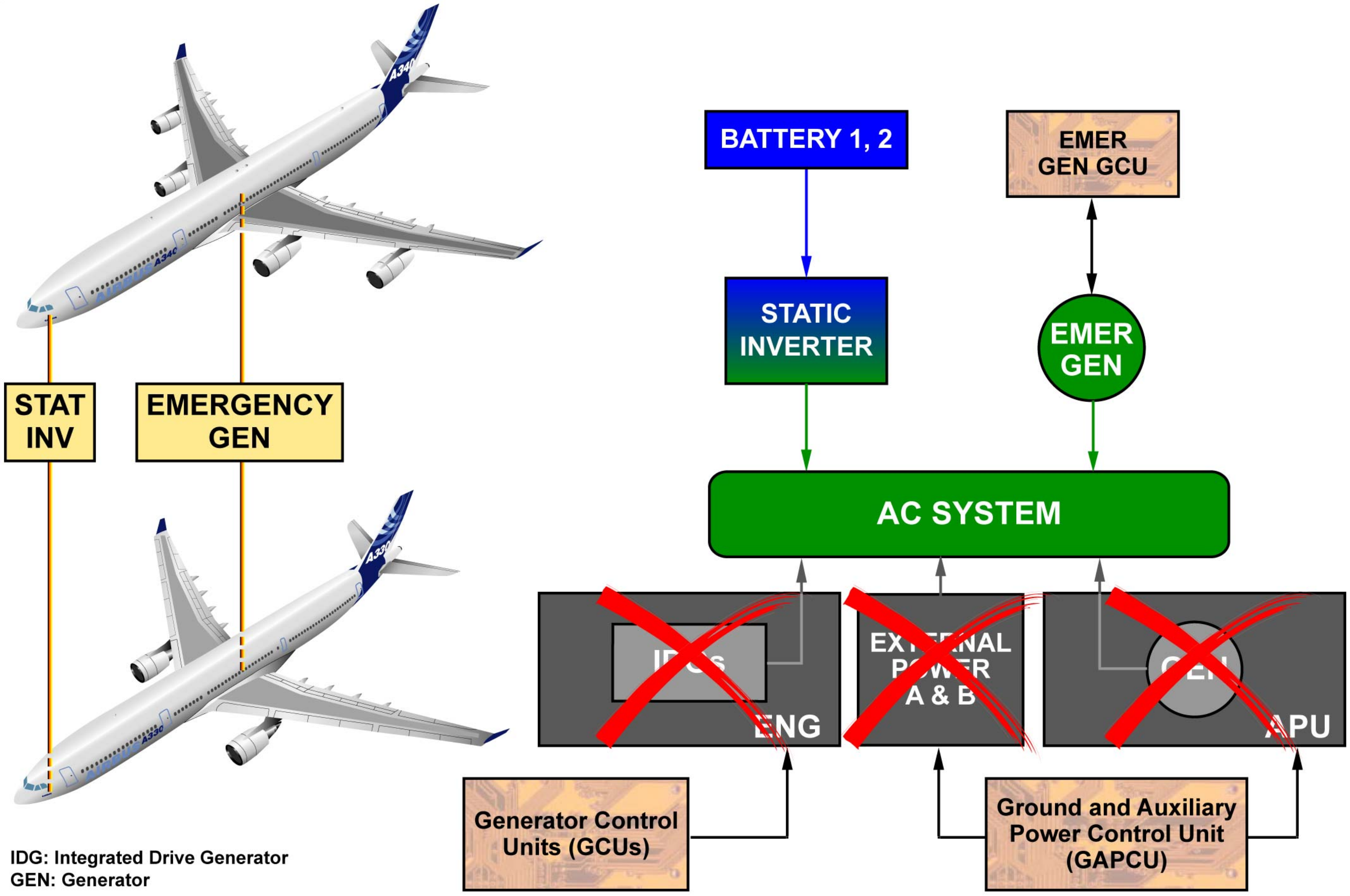
24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

AC GENERATION (continued)

EMERGENCY

In emergency configuration (loss of IDGs and APU GEN, EXT PWR not available), the AC ESS electrical system can be supplied by an emergency generator driven by the green hydraulicpower. This emergency generator is made of:
- a Constant Speed Motor (CSM),
- and an AC generator.

They make together an assembly called the Constant Speed Motor/Generator (CSM/G).
It is located in the MLG bay. The emergency (EMER) GEN is controlled and monitored by the CSM/G Ground Control Unit (often called EMER GCU). If no other AC power source is available (IDGs, APU GEN, EXT PWR and EMER GEN), a static inverter, supplied by the batteries, can supply the essential part of the AC electrical system.



AC GENERATION - EMERGENCY

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

AC GENERATION (continued)

CHARACTERISTICS (A340)

This table gives the characteristics of the different A340 AC power sources. Note that the static inverter is a single phase power source.

G6B08031 - G10T4T0 - FM24P2000000001

	A/C TYPE	POWER	VOLTAGE	FREQUENCY	PHASES
IDG	A340-300	75 KVA	115 V	400 Hz	3
	A340-500/600	90 KVA	115 V	400 Hz	3
APU GENERATOR	A340 ALL	115 KVA	115 V	400 Hz	3
EXTERNAL POWER	A340 ALL	90 KVA	115 V	400 Hz	3
CSM/G	A340-300	5.5 KVA	115 V	400 Hz	3
	A340-500/600	8 KVA	115 V	400 Hz	3
STATIC INVERTER	A340 ALL	2.5 KVA	115 V	400 Hz	1

IDG: Integrated Drive Generator
CSM/G: Constant Speed Motor/Generator

AC GENERATION - CHARACTERISTICS (A340)

G6B08031 - G10T4T0 - FM24P2000000001

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

AC GENERATION (continued)

CHARACTERISTICS (A330)

This table gives the characteristics of the different A330 AC power sources. Note that the static inverter is a single phase power source.

G6B08031 - G10T4T0 - FM24P2000000001

	A/C TYPE	POWER	VOLTAGE	FREQUENCY	PHASES
IDG	A330-200 A330-300	115 KVA	115 V	400 Hz	3
APU GENERATOR		115 KVA	115 V	400 Hz	3
EXTERNAL POWER		90 KVA	115 V	400 Hz	3
CSM/G		8 KVA	115 V	400 Hz	3
STATIC INVERTER		2.5 KVA	115 V	400 Hz	1

IDG: Integrated Drive Generator
CSM/G: Constant Speed Motor/Generator

AC GENERATION - CHARACTERISTICS (A330)

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

DC GENERATION

GENERAL

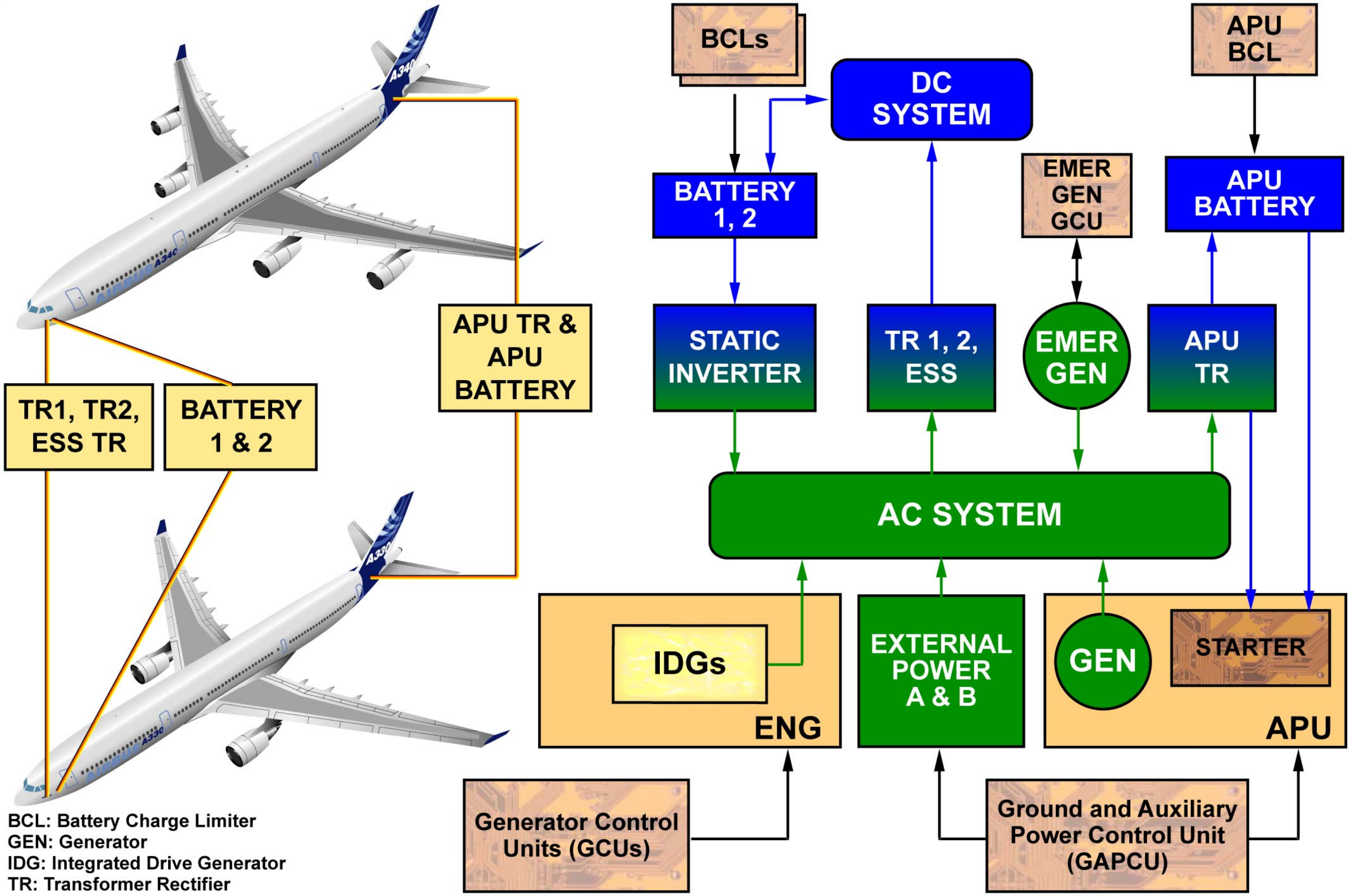
In this topic, we will speak about the DC sources that can supply the DC electrical system.

TRANSFORMER RECTIFIERS SUPPLY

The DC electrical system is supplied from the AC network via 3 Transformer Rectifiers (TRs). As a back-up source, a part of the DC network can be supplied from the batteries. The batteries can be also connected to the DC system for charging. The coupling of the batteries is controlled by two Battery Charge Limiters (BCLs).

APU START SUPPLY

The APU starting has a dedicated network (APU BATT and APU TRU). The APU battery or the APU TR or both at the same time can be used to start the APU. The APU battery is charged by the APU TR. The APU battery coupling is controlled by the APU BCL.



BCL: Battery Charge Limiter
GEN: Generator
IDG: Integrated Drive Generator
TR: Transformer Rectifier

DC GENERATION & APU START SUPPLY

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

CONTROL & INDICATING

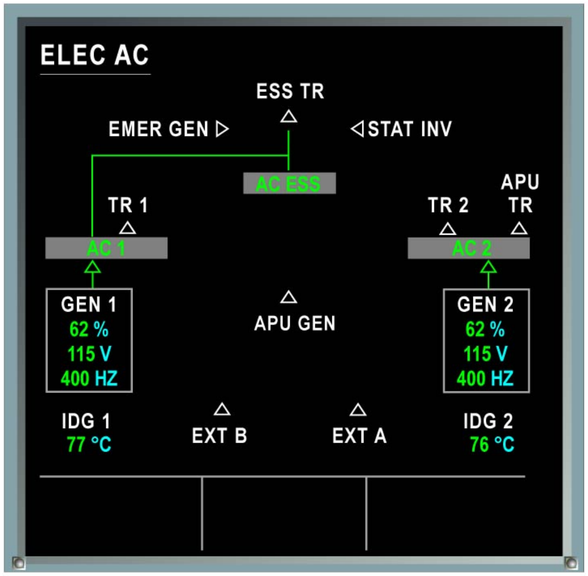
In this topic, we will present the main interfaces with the electrical system.

AC GENERATION

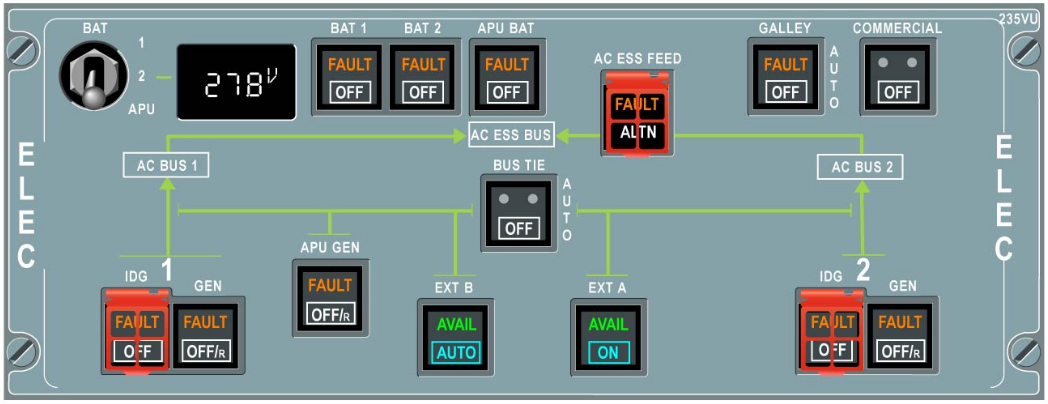
The lower part of the electrical panel is the AC part. It controls and monitors the main AC power sources which are:
- IDGs,
- EXT PWR A and B,
- and APU GEN.

The EMERgency ELECtrical PoWeR panel contains the P/BSWs and indicators to control and monitor the emergency power source, which is the emergency generator (CSM/G). Notice that there is no manual control to activate the static inverter (STAT INV). The AC electrical page of the ECAM presents the AC sources and how they are connected to the network. The most important parameters are also monitored.
The philosophy is the same for the A340. For the A340-500/600 the Electrical Load Management Unit (ELMU) is used to control and monitor the A/C loads.

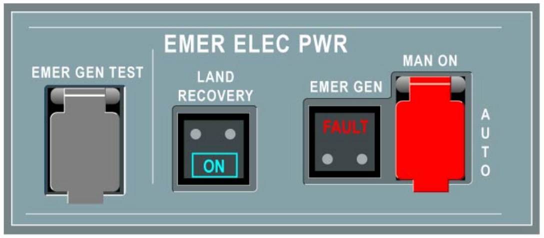
A330



ECAM PAGE



(235VU)



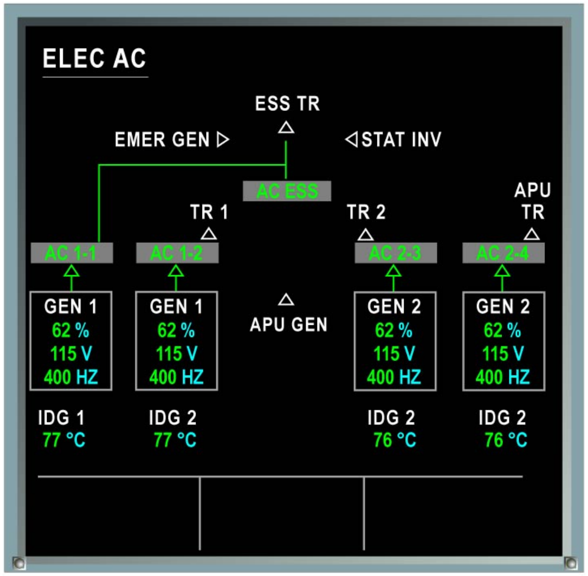
(211VU)

CONTROL & INDICATING - AC GENERATION

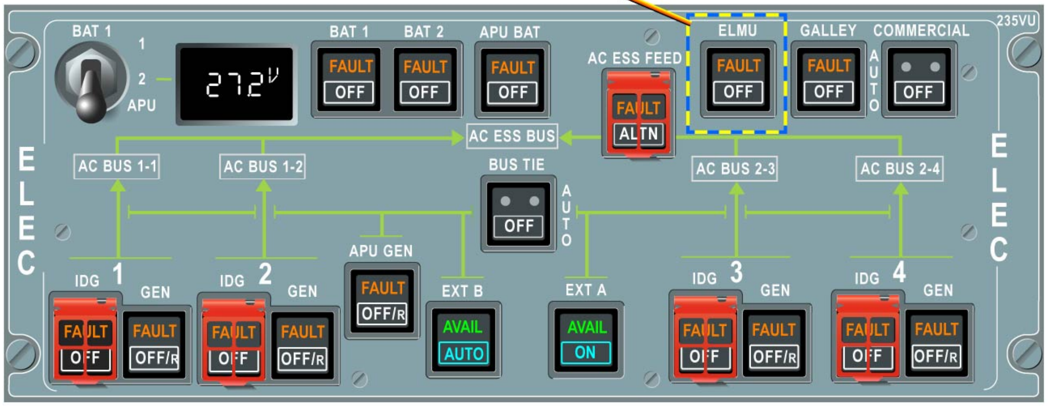
G6B08031 - G10T4T0 - FM24P2000000001

A340

ELMU ONLY AVAILABLE FOR A340-500 AND A340-600



ECAM PAGE



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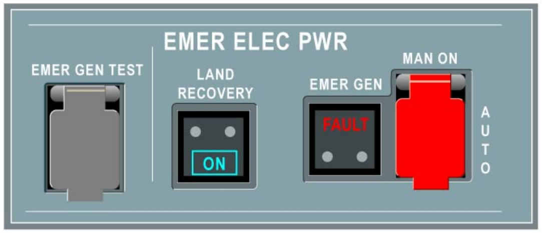

(211VU)

CONTROL & INDICATING - AC GENERATION

G6B08031 - G10T4T0 - FM24P2000000001

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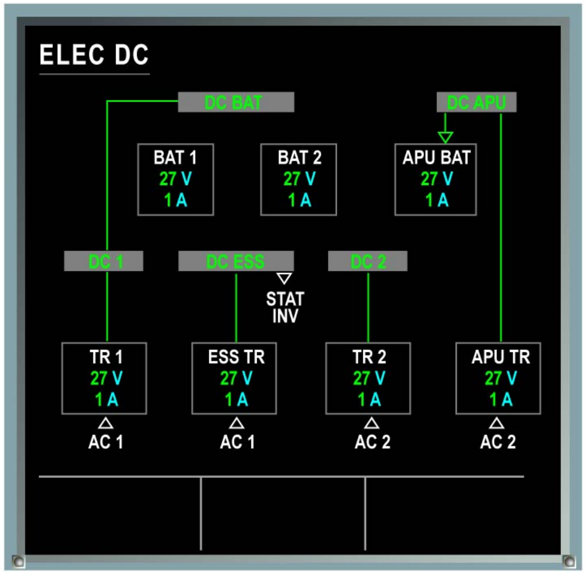
24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

CONTROL & INDICATING (continued)

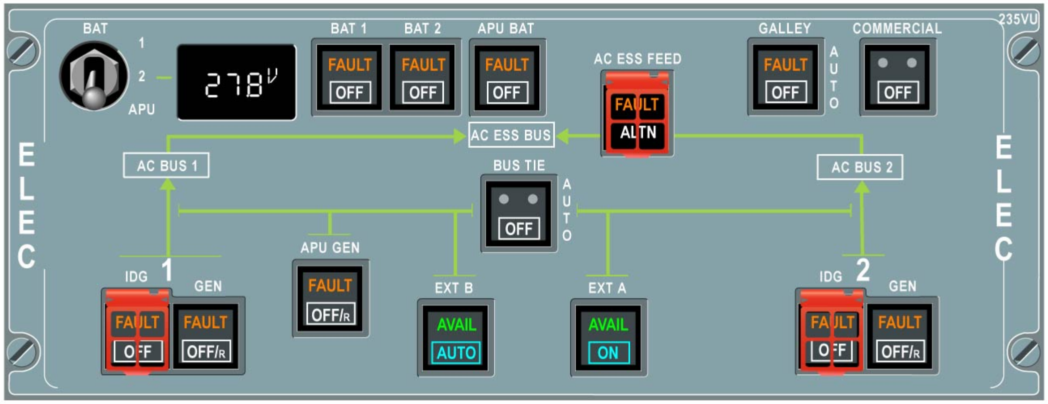
DC GENERATION

The upper left part of the ELEC panel controls and monitors the batteries. The DC ELEC page of ECAM presents the DC sources and how they are connected to the network.
The philosophy is the same for the A340.

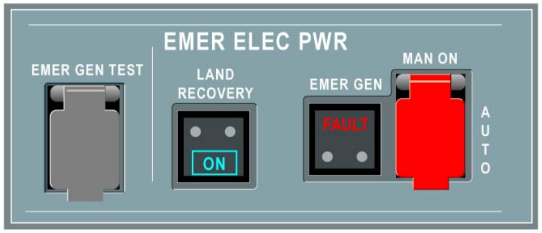
A330



ECAM PAGE



(235VU)



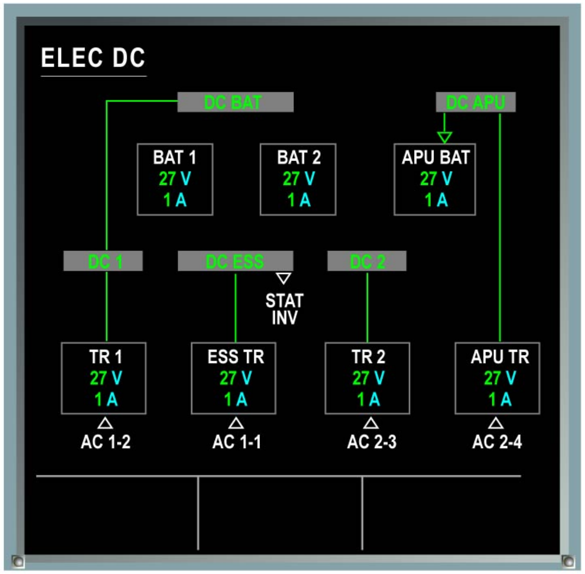
(211VU)

CONTROL & INDICATING - DC GENERATION

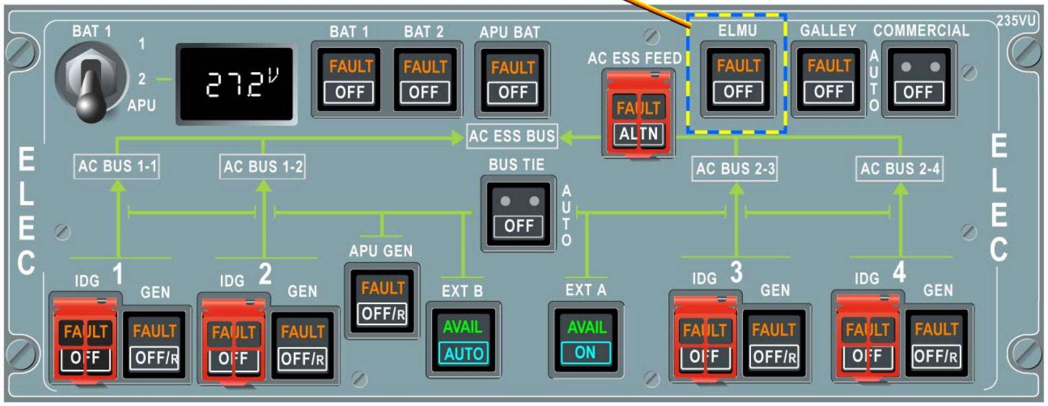
G6B08031 - G10T4T0 - FM24P2000000001

A340

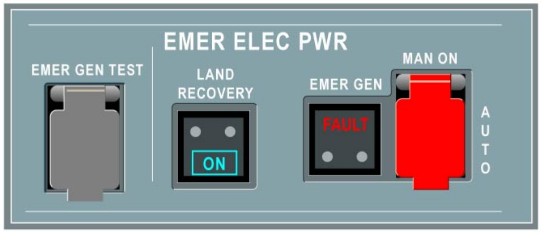
ELMU ONLY AVAILABLE FOR A340-500 AND A340-600



ECAM PAGE



(235VU)



(211VU)

CONTROL & INDICATING - DC GENERATION

G6B08031 - G10T4T0 - FM24P2000000001

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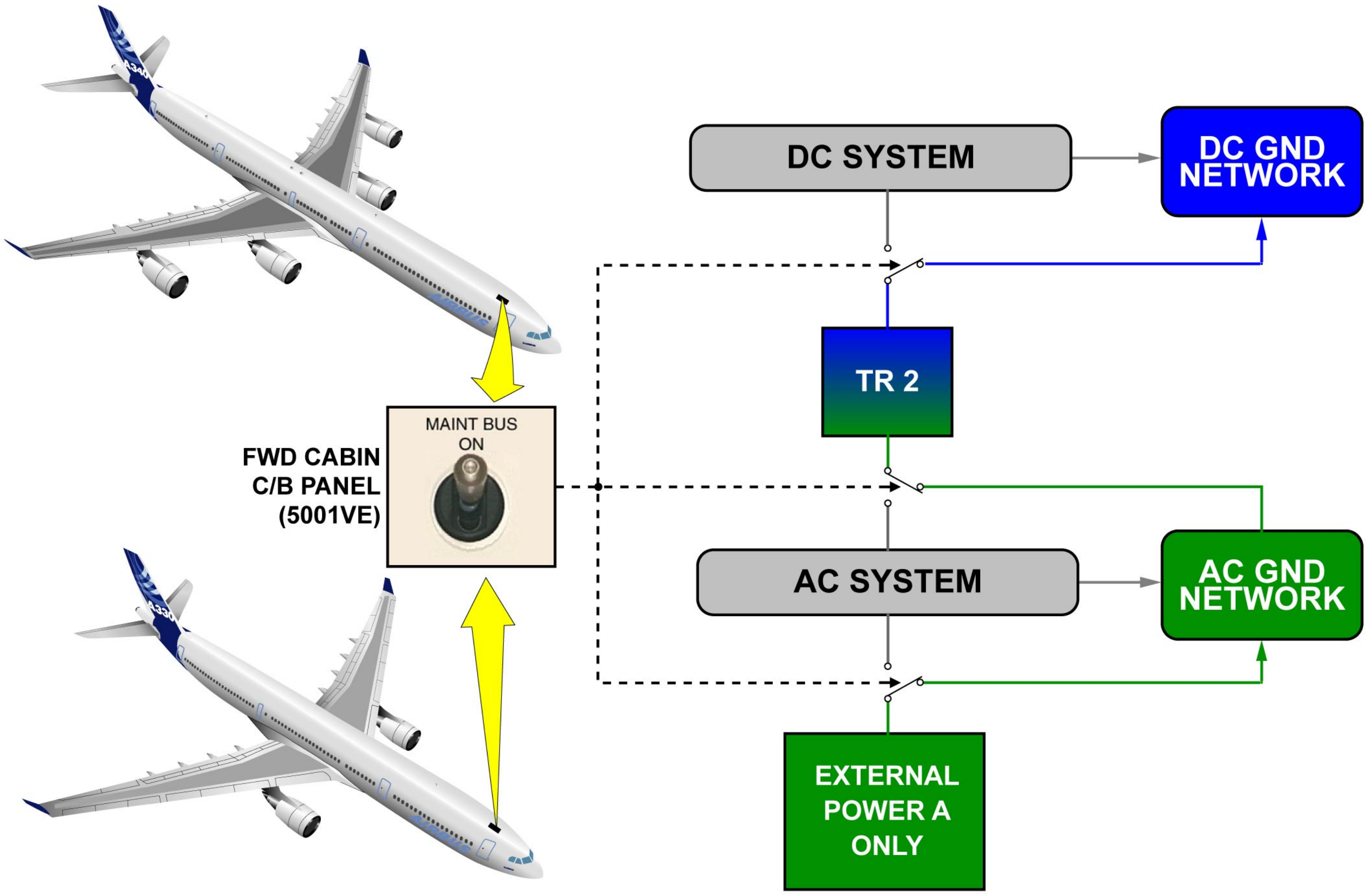
24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

GROUND SERVICE NETWORK

A MAINTenance BUS switch is used to supply the ground service electrical network without energizing the whole electrical network. When the switch is in the ON position, the EXT PWR A only, supplies the ground service network.



GROUND SERVICE NETWORK

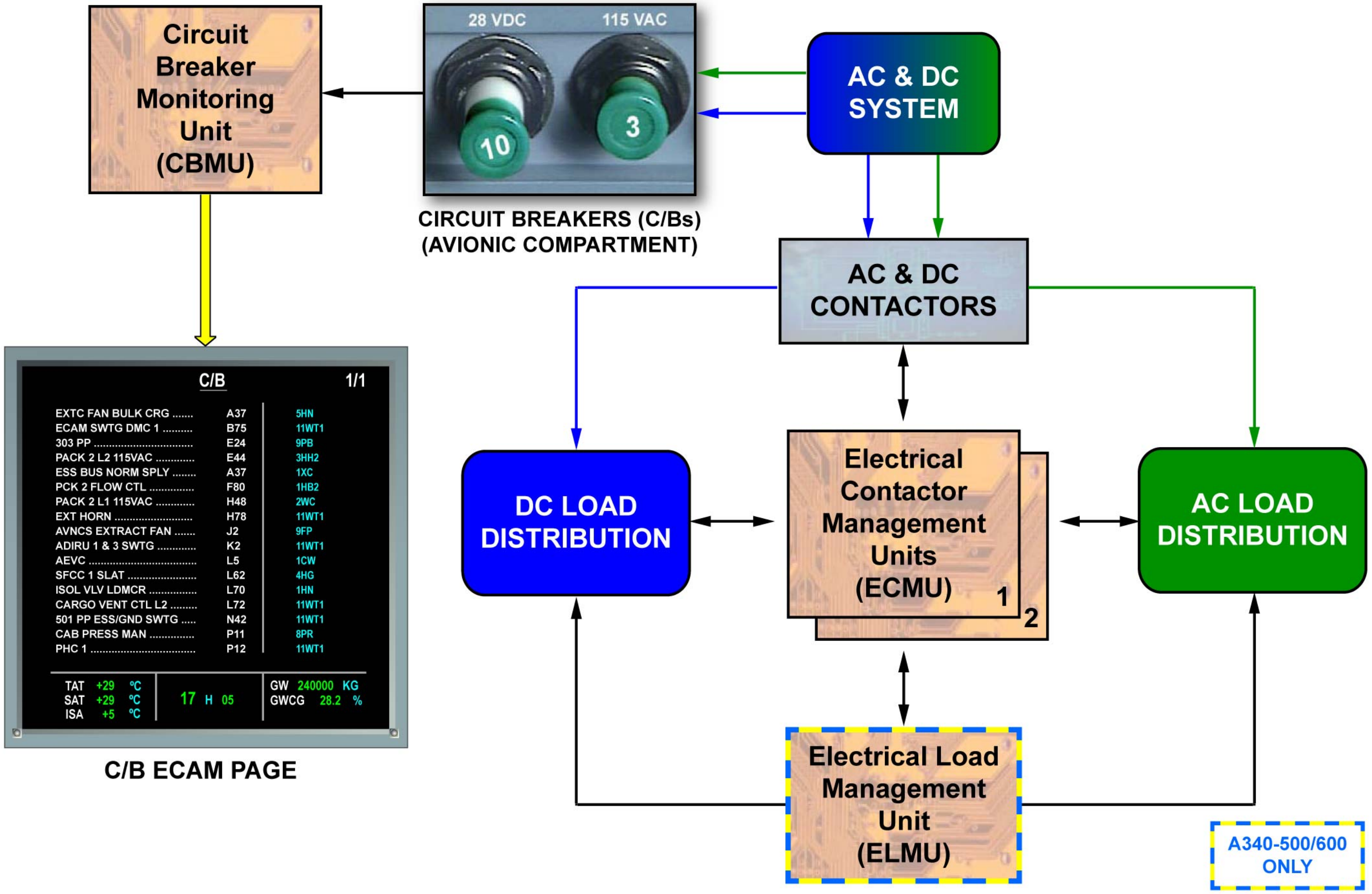
24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

CONTACTOR MANAGEMENT AND C/Bs MONITORING

The two Electrical Contactor Management Units (ECMUs) control and monitor the main AC and DC contactors distributing to the electrical network a number of available supply sources. A Circuit Breaker Monitoring Unit (CBMU) monitors the C/Bs and the Remote Control Circuit Breakers (RCCBs) status. It indicates on the ECAM any tripped or manually pulled green colored C/Bs or RCCBs.

LOAD MANAGEMENT

The ECMUs have protective functions, which become active in case of a power source overload, they carry out a preprogrammed shedding of some loads (galleys, service sub-busbars...). For A340-500 and A340-600, due to a high number of galleys, an ELMU is installed and achieves this shedding task.

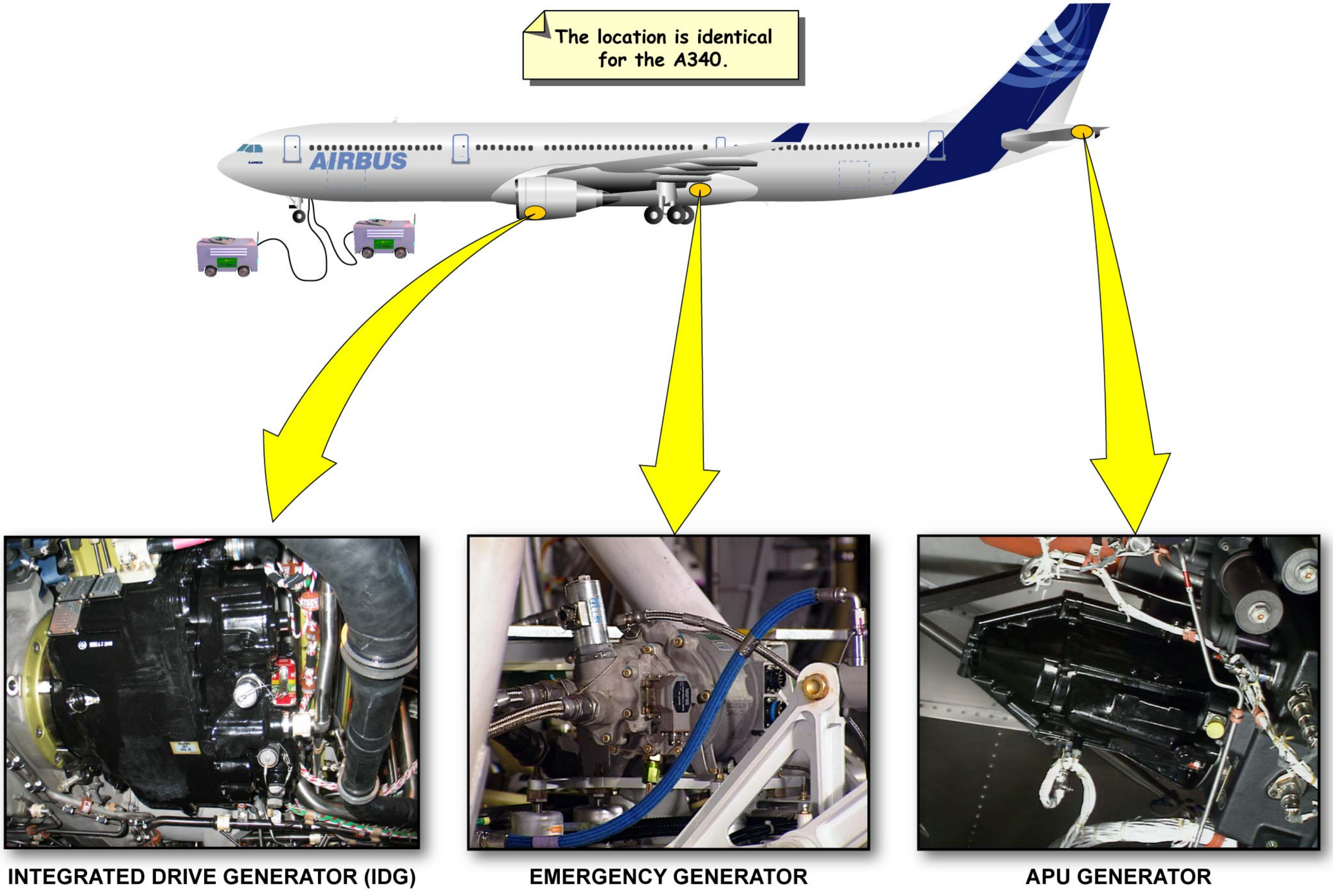


CONTACTOR MANAGEMENT AND C/BS MONITORING & LOAD MANAGEMENT

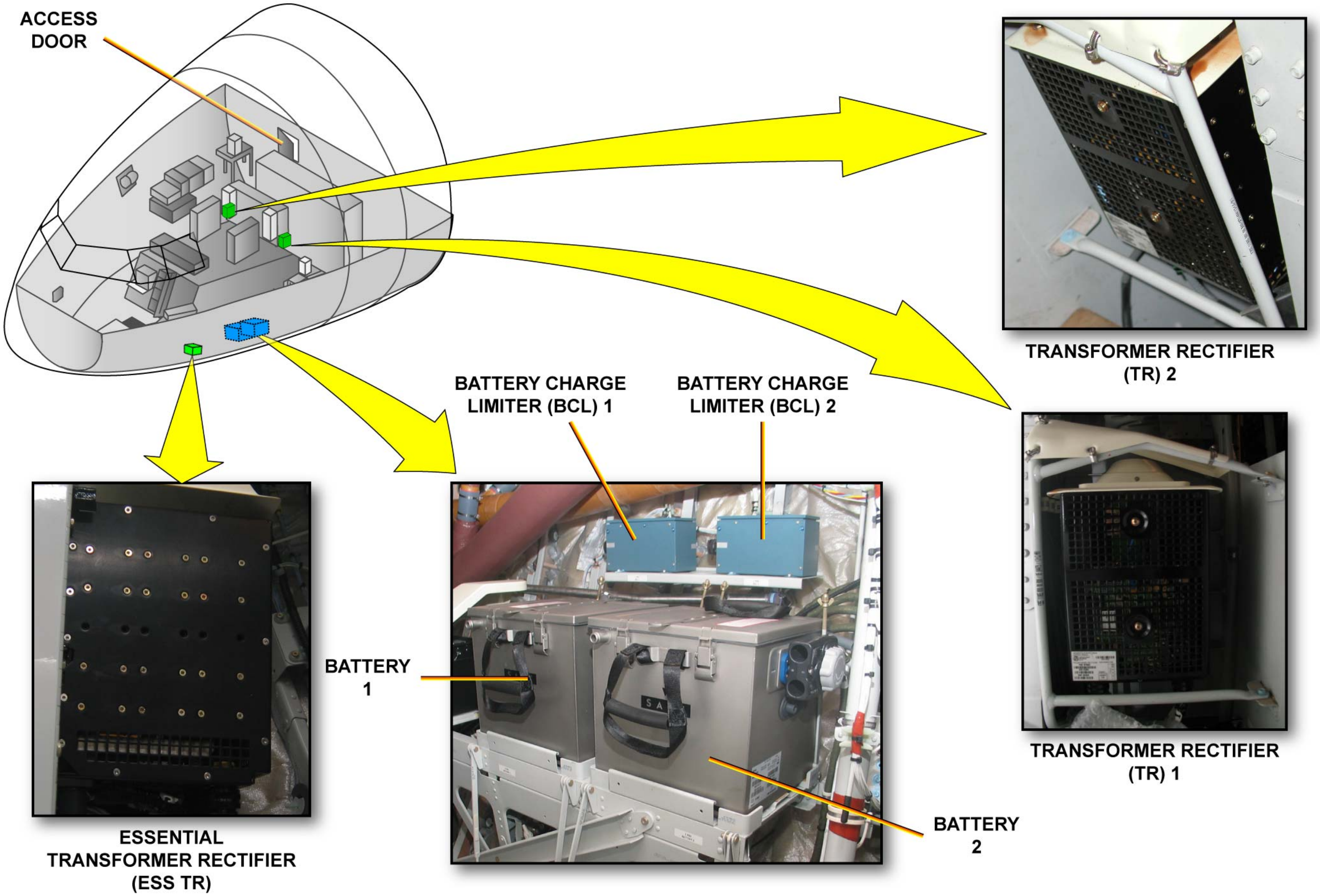
24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

COMPONENT LOCATION

The AC generators supply a 115V AC, 3-phase, 400 Hz AC supply. The entire AC electrical system can also be supplied by two external power sources, EXT PWR A and/or EXT PWR B.
The BCLs control the batteries coupling and uncoupling to the DC battery buses to protect and charge the batteries. The nominal voltage of the batteries is 24V. TR1, TR2 and ESSential TR are identical and interchangeable. They convert 115V AC to 28V DC. They can sustain a continuous 200 A output DC current when installed in TR1 And TR2 position as they are cooled by air conditioning. In ESS TR position, due to the fact that they are only ventilated by natural convection, they can only sustain a 100 A continuous operation.
The APU TR, APU BCL and APU battery are located in the bulk cargo compartment. Note that APU TR is identical and interchangeable with TR1, TR2 and ESS TR. It is also only ventilated by natural convection.
The GAPCU connects the EXT PWR to the A/C network if all parameters are within limits. It is also the unit connected to the Central Maintenance Computers (CMCs) for on-board maintenance functions. The GAPCU controls the APU GEN and the EXT PWR. The EMER GCU connects the EMER GEN to the ESS network, if all conditions are met. The STAT INV converts the DC voltage from battery 1 and 2 into an AC 115V AC single phase if no other AC source is available.
The GCUs, CBMU, ECMUs and ELMU are located in the avionics compartment, adjacent to C/B panels. Note that the ELMU is only installed on the A340 500/600.
The main C/B panels are located in the avionics compartment.
The MAINT BUS switch, located on the forward cabin C/B panel, allows the AC and DC service buses to be supplied without energizing the complete A/C electrical network.
The external power control panel and the external power receptacles are located aft of the NLG. On this panel, 4 lights indicate the Ground Power Unit (GPU) A and/or B availability (AVAIL light) and connection to the A/C network (NOT IN USE light).

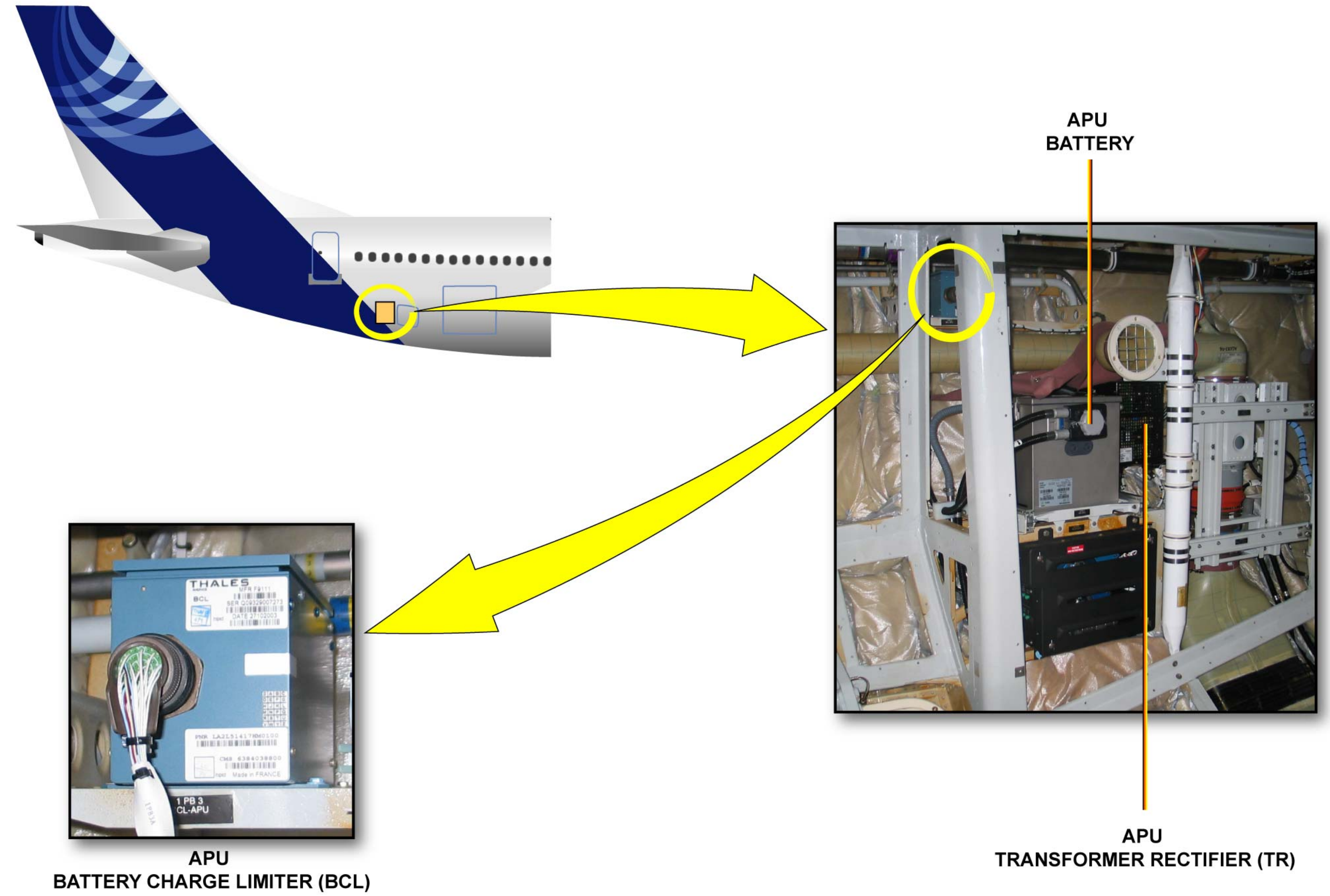


COMPONENT LOCATION



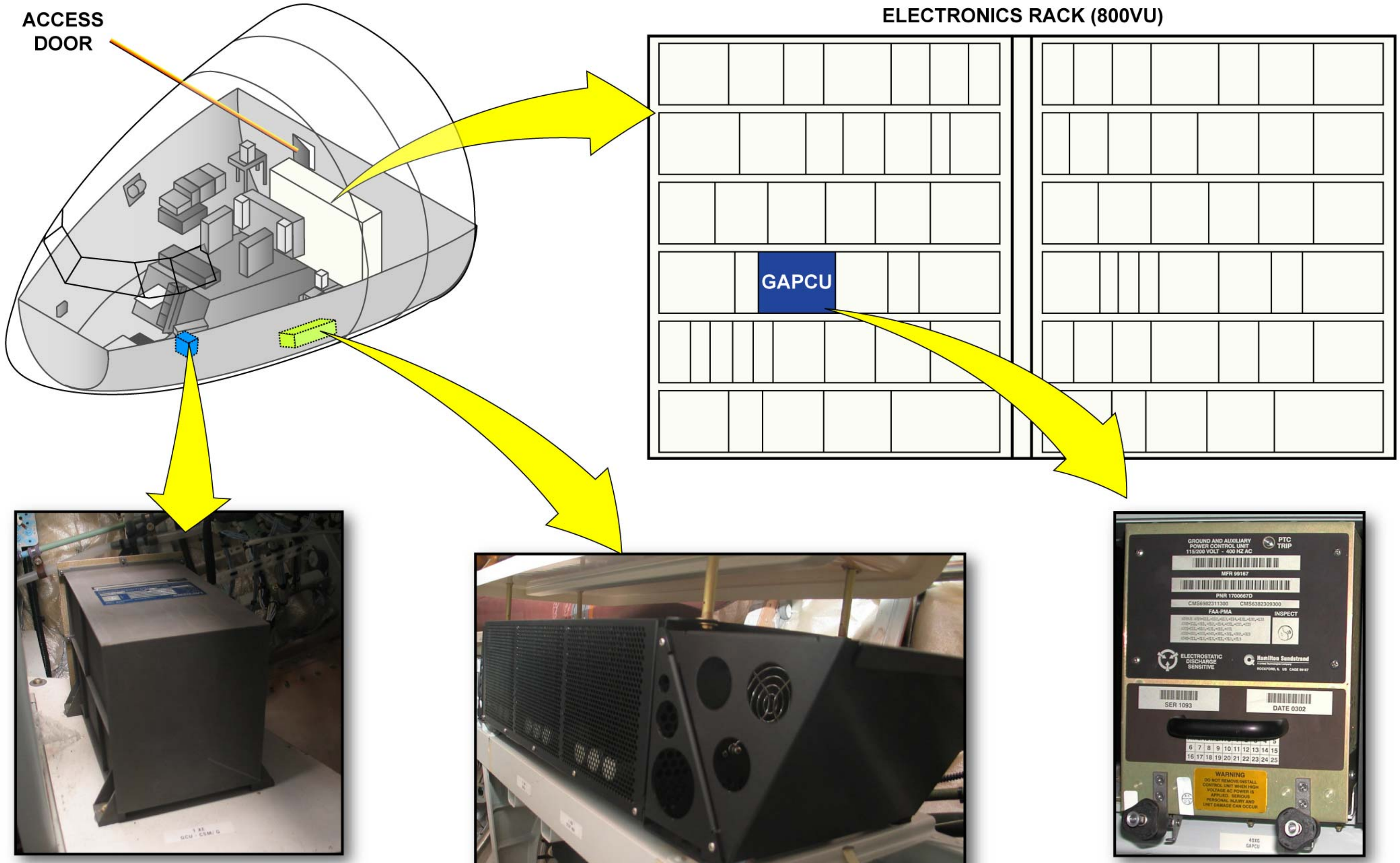
COMPONENT LOCATION

G6B08031 - G10T4T0 - FM24P2000000001



COMPONENT LOCATION

G6B08031 - G10T4T0 - FM24P2000000001



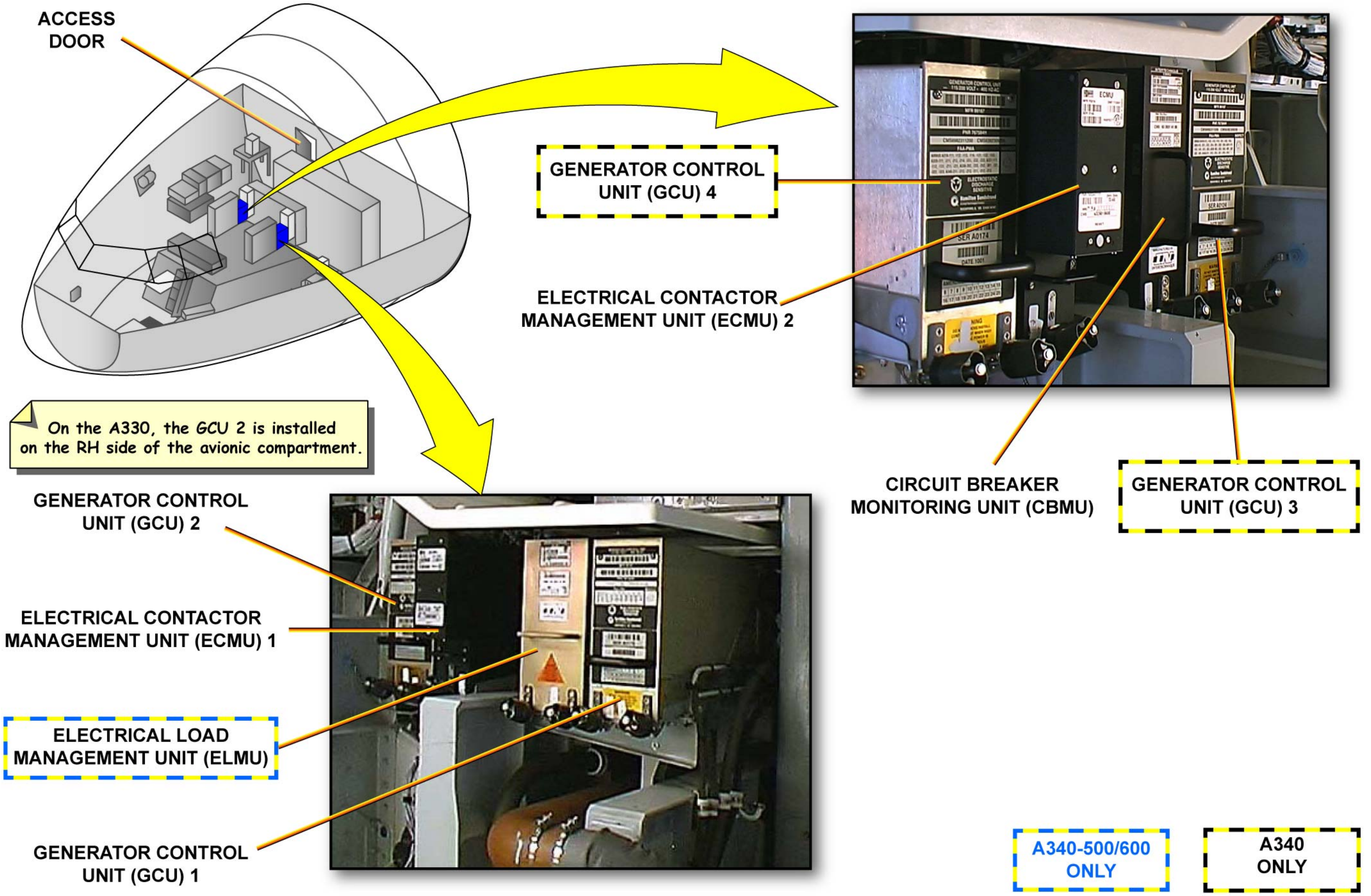
EMERGENCY GENERATOR CONTROL UNIT (EMER GCU)

STATIC INVERTER

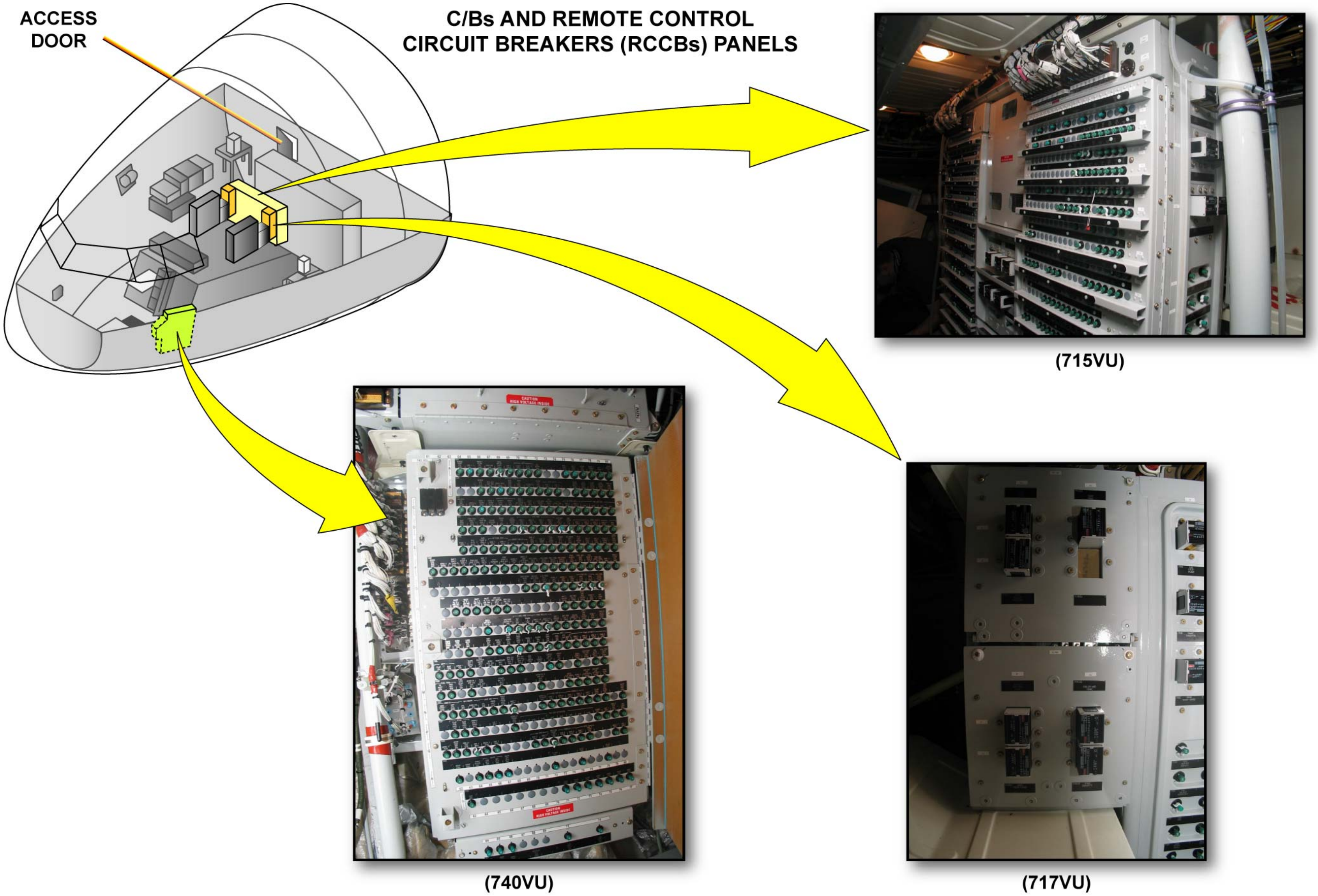
GROUND AND AUXILIARY POWER CONTROL UNIT (GAPCU)

COMPONENT LOCATION

G6B08031 - G10T4T0 - FM24P2000000001

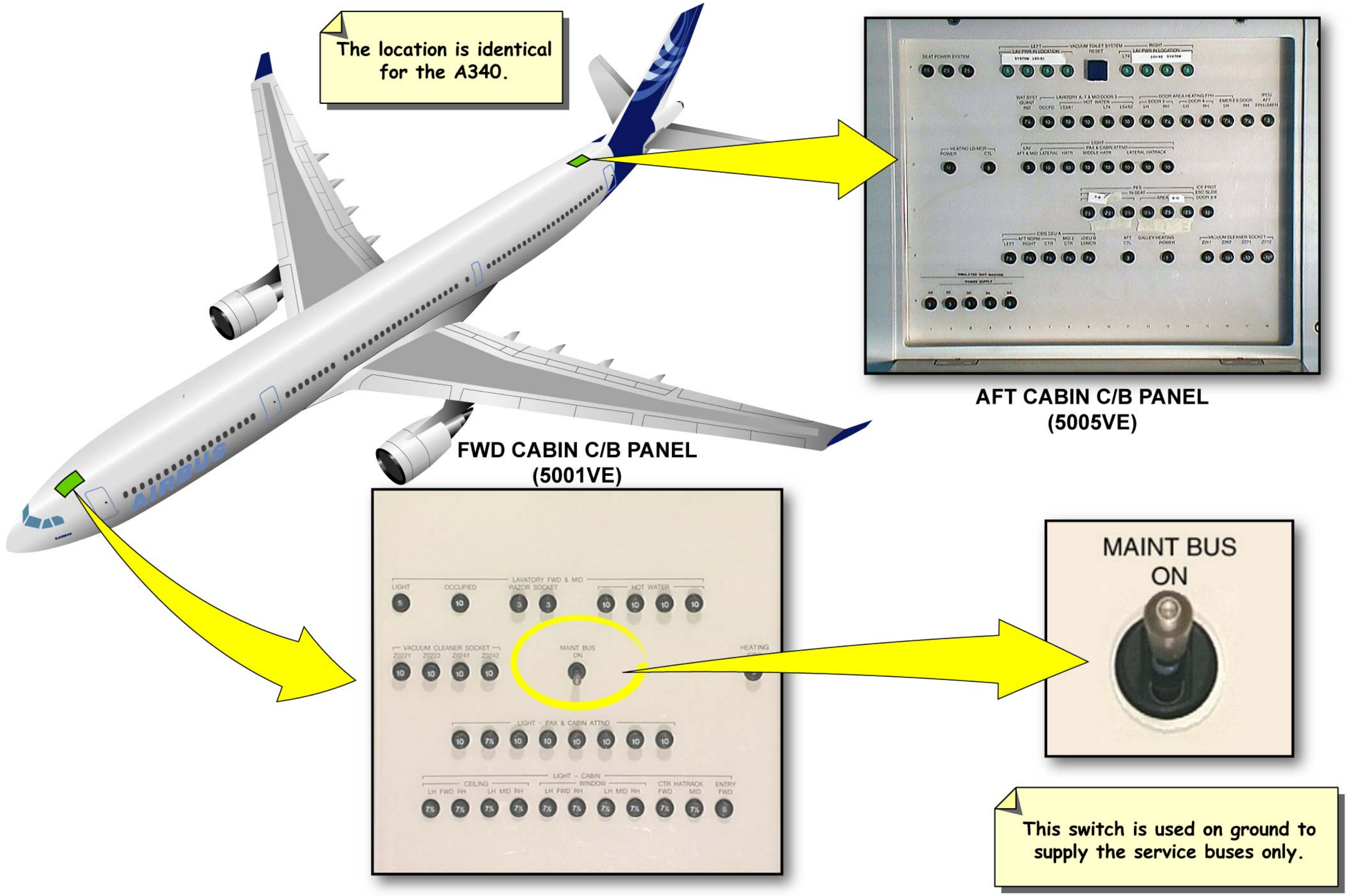


COMPONENT LOCATION



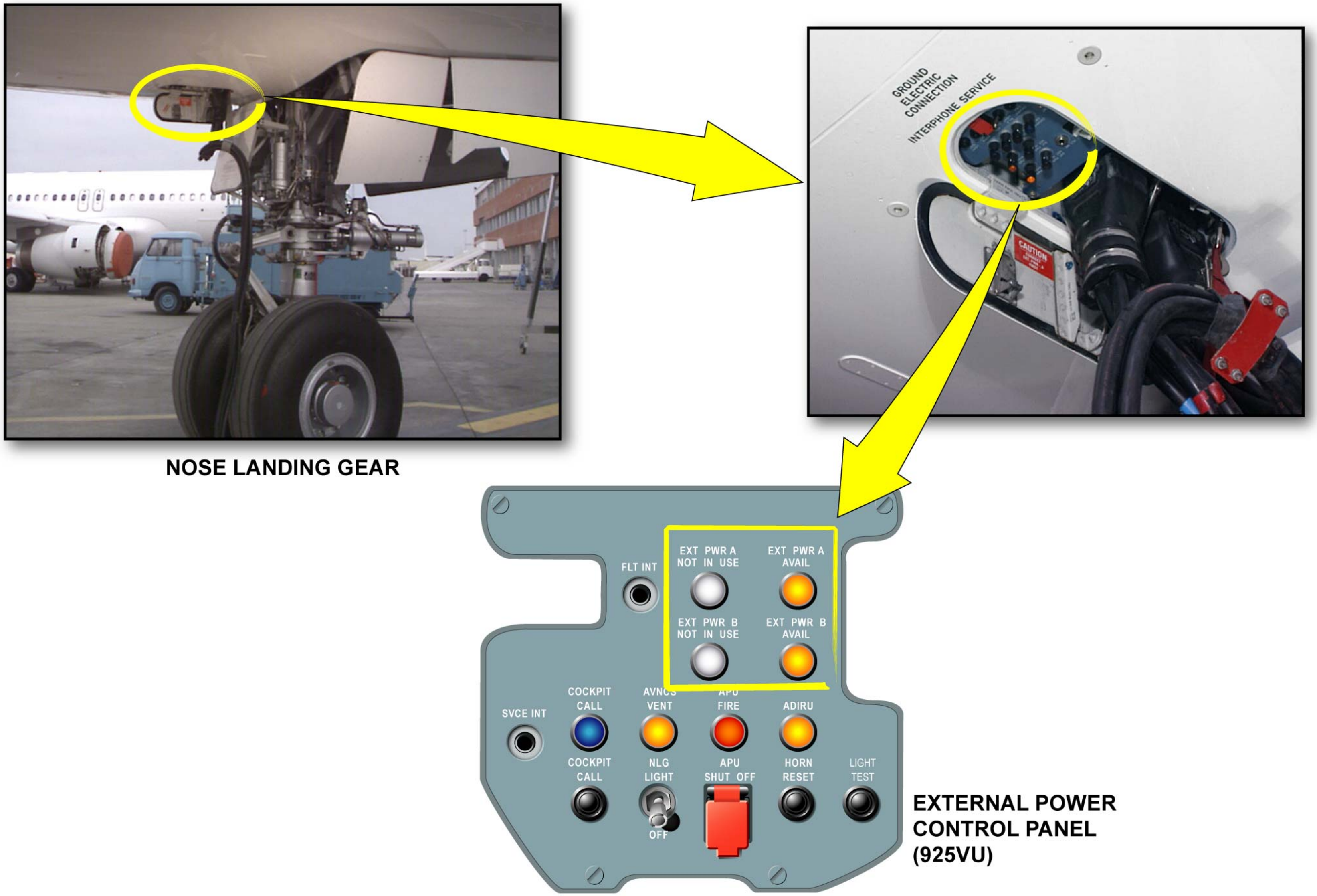
COMPONENT LOCATION

G6B08031 - G10T4T0 - FM24P2000000001



COMPONENT LOCATION

G6B08031 - G10T4T0 - FM24P2000000001



COMPONENT LOCATION

G6B08031 - G10T4T0 - FM24P2000000001

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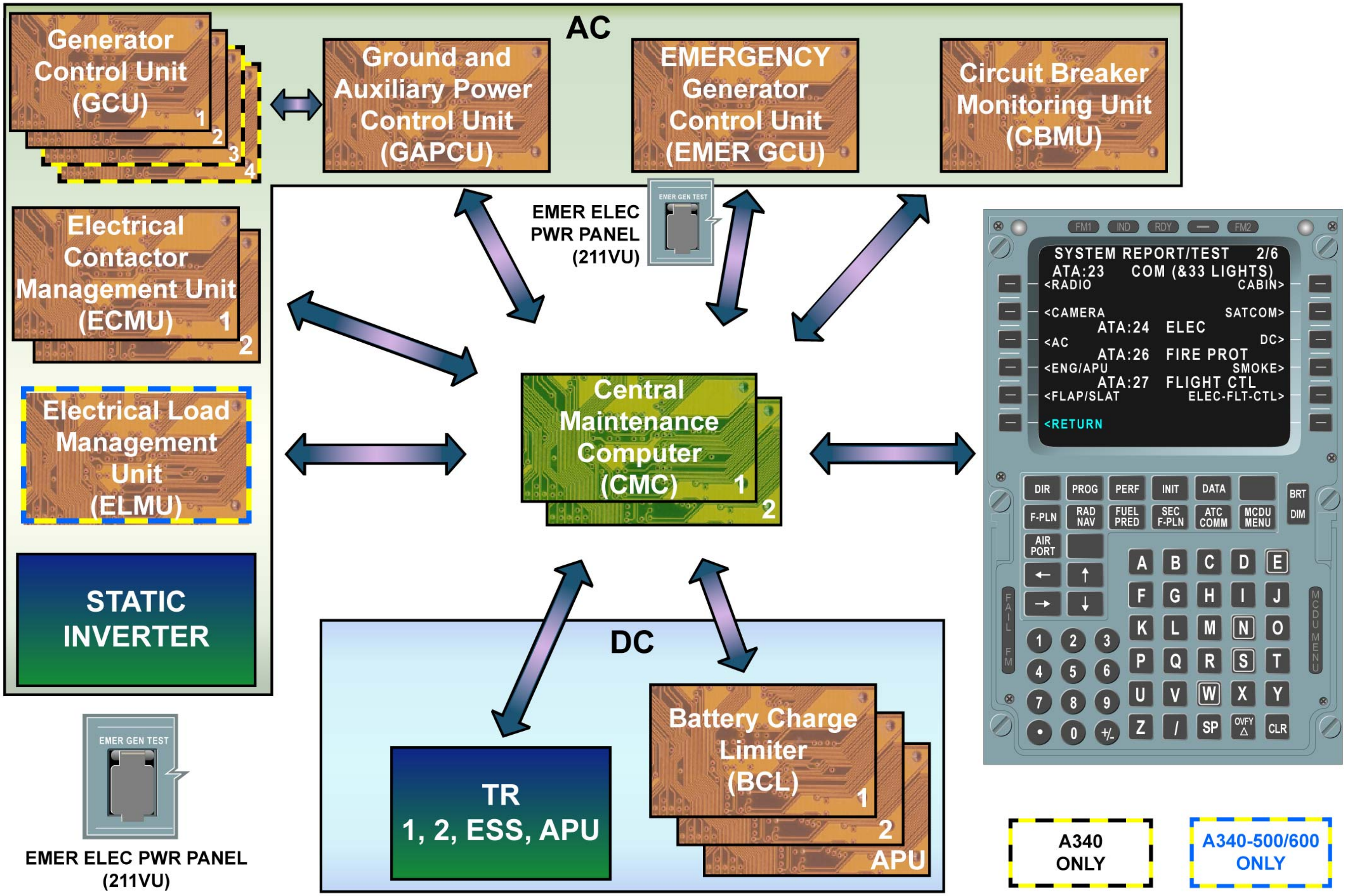
24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

Maintenance/test facilities and trouble shooting data are retrieved via the CMCs. Test of the emergency generator (CSM/G) and the STAT INV are initiated from the EMER ELEC PWR panel.



MAINTENANCE/TEST FACILITIES

G6B08031 - G10T4T0 - FM24P2000000001

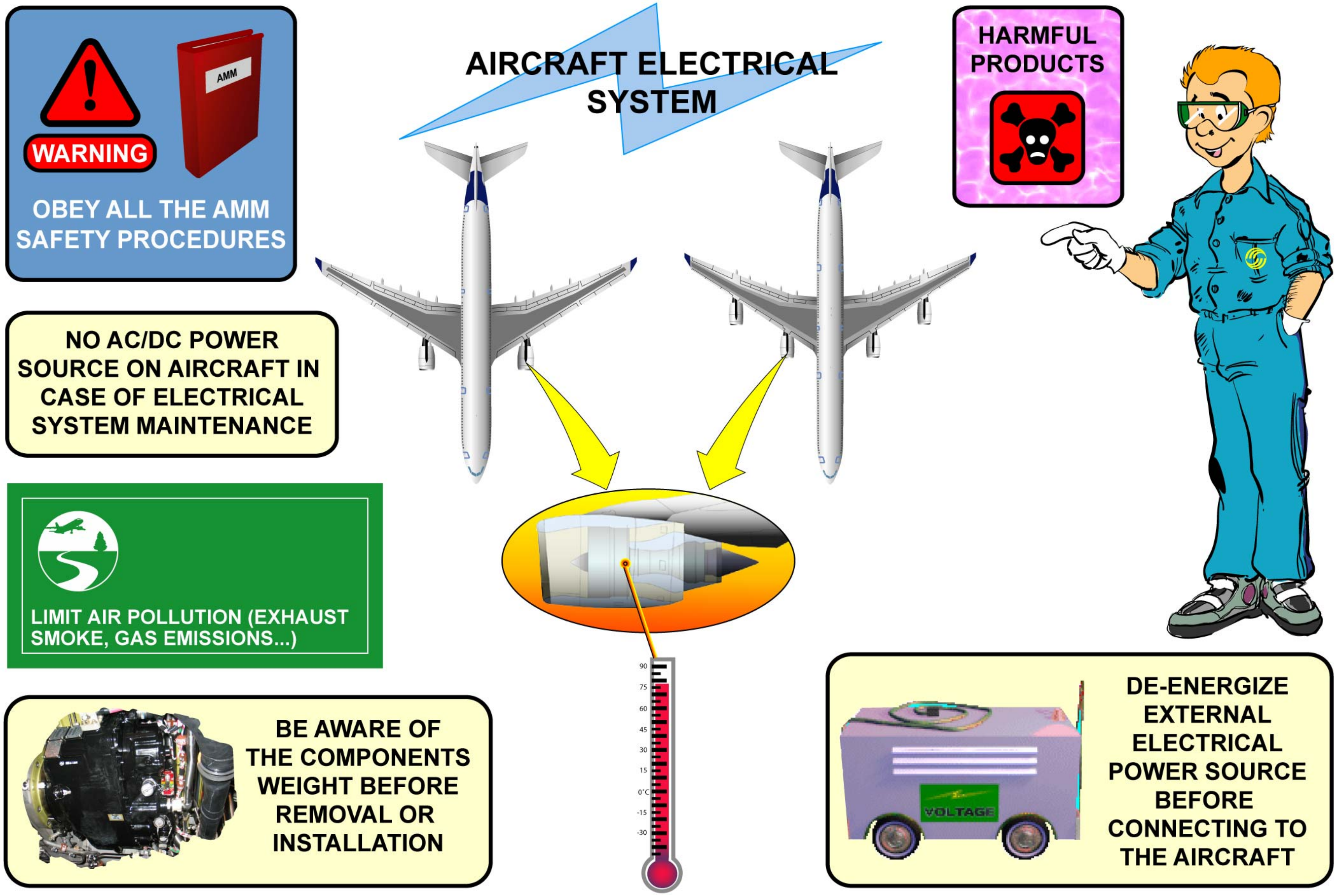
24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

When you work on the electrical system, make sure that you obey all the AMM safety procedures. This will prevent injury to persons and/or damage to the aircraft. Here is an overview of main safety precautions relative to the electrical system. When you do any maintenance task on the electrical system, there is a risk of electrocution if the AC or DC power remains connected. Follow the AMM procedures and warnings. You must make sure that you can hold the component before to remove/install it, some components are heavy. If it falls, it can cause injury to persons and damage to equipment.
Before you connect the Ground Power Unit (GPU) to the external power receptacle of the aircraft, make sure that the external electrical power supply is not energized, dangerous arcing can occur. Make sure that all the circuits are isolated before you supply electrical power to the aircraft. Be careful when you work on the engine components, immediately after the engine shutdown; the components can remain hot during one hour. Hot parts can cause an injury and hot oil can burn your eyes and skin. When you are in contact with oil, fuel or other harmful products use goggles, insulated gloves and other protective clothes. Use solvents/cleaning agents, sealant and other special materials only in a good ventilated work area.

ENVIRONMENTAL PRECAUTIONS

Avoid use of the APU if APU BLEED air is not necessary. Turn-off unused ground service equipment (GPU, air conditioning cart, etc...) if no work is being done or nobody is present on the aircraft.



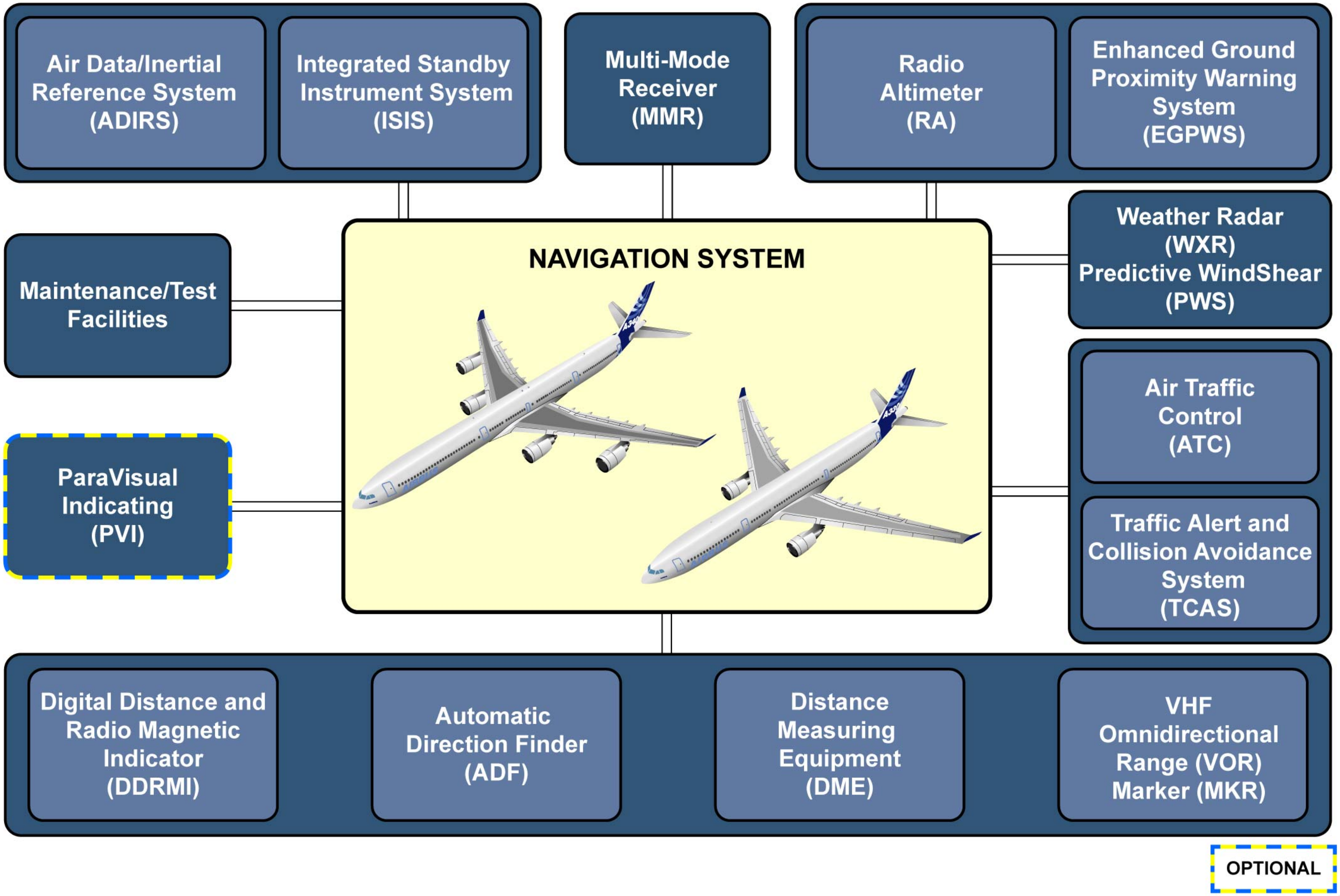
SAFETY PRECAUTIONS - ENVIRONMENTAL PRECAUTIONS

34 NAVIGATION SYSTEM PRESENTATION (1)

GENERAL

SUB-SYSTEMS

The navigation system is composed of several sub-systems, which are:
- the Air Data/Inertial Reference System (ADIRS),
- the Integrated Standby Instrument System (ISIS),
- the Multi-Mode Receiver (MMR),
- the Radio Altimeter (RA),
- the Enhanced Ground Proximity Warning System (EGPWS),
- the Weather Radar (WXR) with Predictive WindShear (PWS) capability (if installed),
- the Air Traffic Control (ATC),
- the Traffic Alert and Collision Avoidance System (TCAS),
-the VOR and MKR beacon,
- the Distance Measuring Equipment (DME),
- the Automatic Direction Finder (ADF) if installed,
- the Digital Distance and Radio Magnetic Indicator (DDRMI),
- the Paravisual Indicating (PVI) if installed,
- the maintenance/test facilities.



GENERAL - SUB-SYSTEMS

34 NAVIGATION SYSTEM PRESENTATION (1)

GENERAL (continued)

SUB-SYSTEMS GROUPS

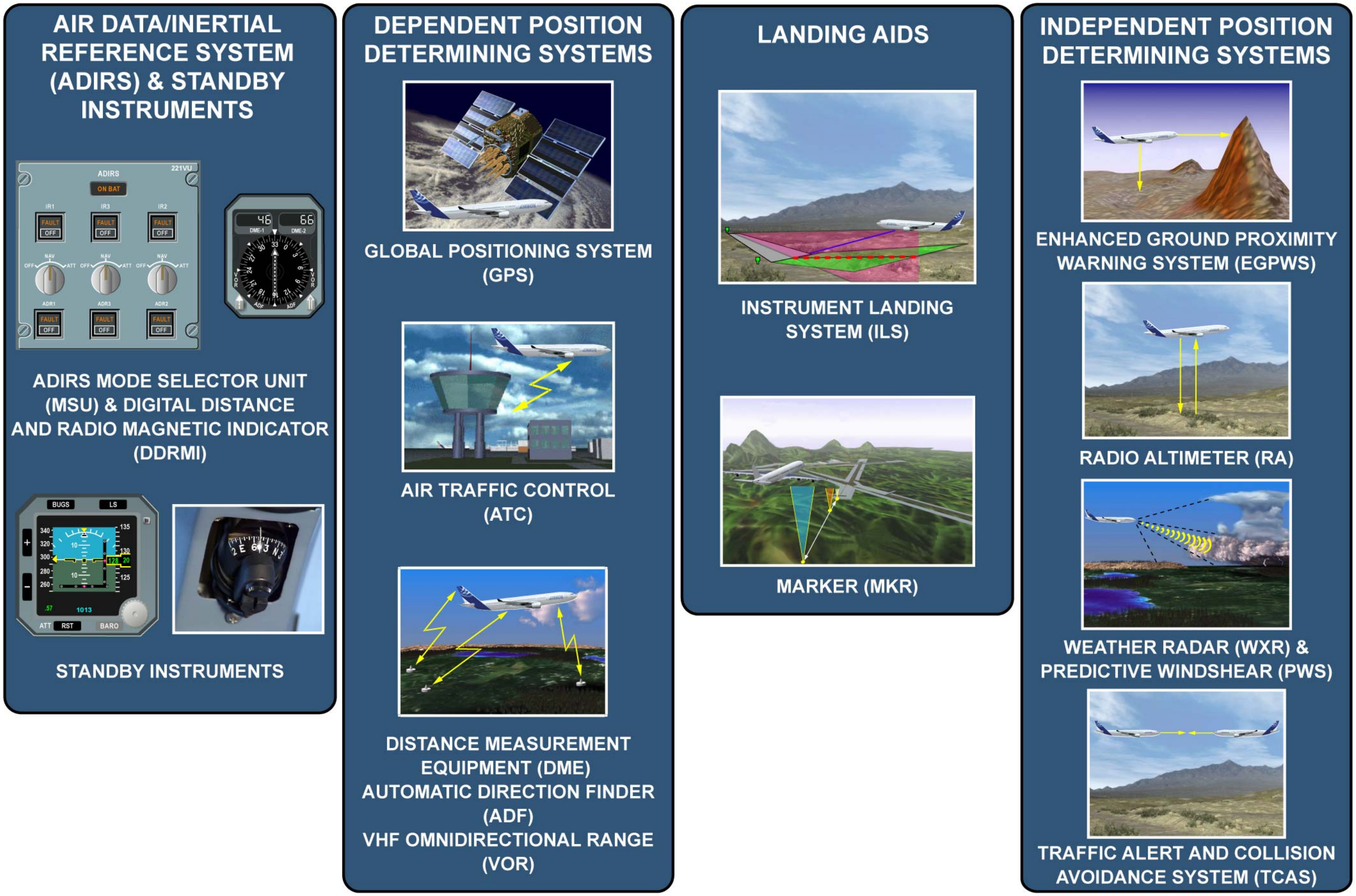
The navigation system is broken down into 4 main groups:
- ADIRS and standby instruments,
- dependent position determining systems,
- landing aids and,
- independent position determining systems.

There are several subsystems within each group. The first group includes:
- Air Data/Inertial Reference Units (ADIRUs),
- DDRMI,
- the standby instruments (magnetic compass and ISIS).

The second group (dependent position determining systems) includes:
- GPS,
- ATC,
- DME,
- ADF,
- VOR.

The third group (landing aids) includes ILS and MRK receivers. The fourth group (independent position determining systems) includes:
- EGPWS,
- RAs,
- WXR and PWS,
- TCAS.

G6B08031 - G10T4T0 - FM34PB000000001



GENERAL - SUB-SYSTEMS GROUPS

G6B08031 - G10T4T0 - FM34PB000000001

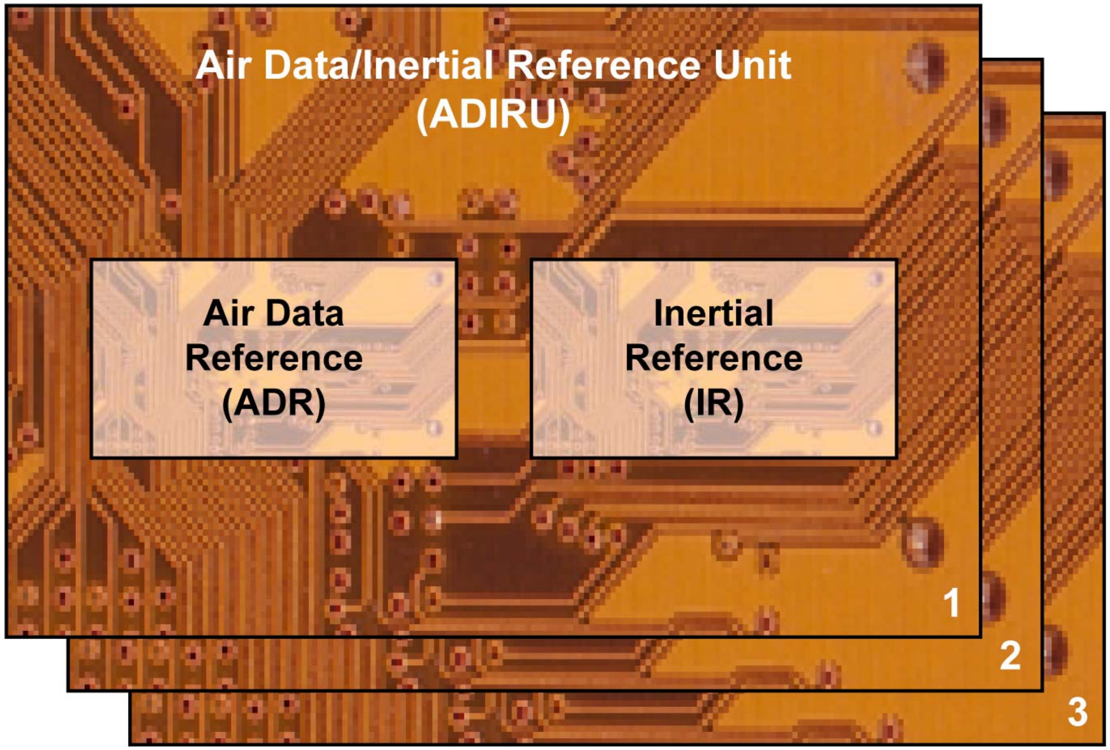
34 NAVIGATION SYSTEM PRESENTATION (1)

ADIRS

GENERAL

The A/C has three identical and interchangeable ADIRUs. Each ADIRU combines two functions in a single unit and a shared power supply:
- an Air Data Reference (ADR) unit,
- a strapdown Inertial Reference (IR) unit, using laser gyros and accelerometers.

The ADR and IR parts of each ADIRU operate independently, and the failure of one system does not affect the other one.



ADIRS - GENERAL

34 NAVIGATION SYSTEM PRESENTATION (1)

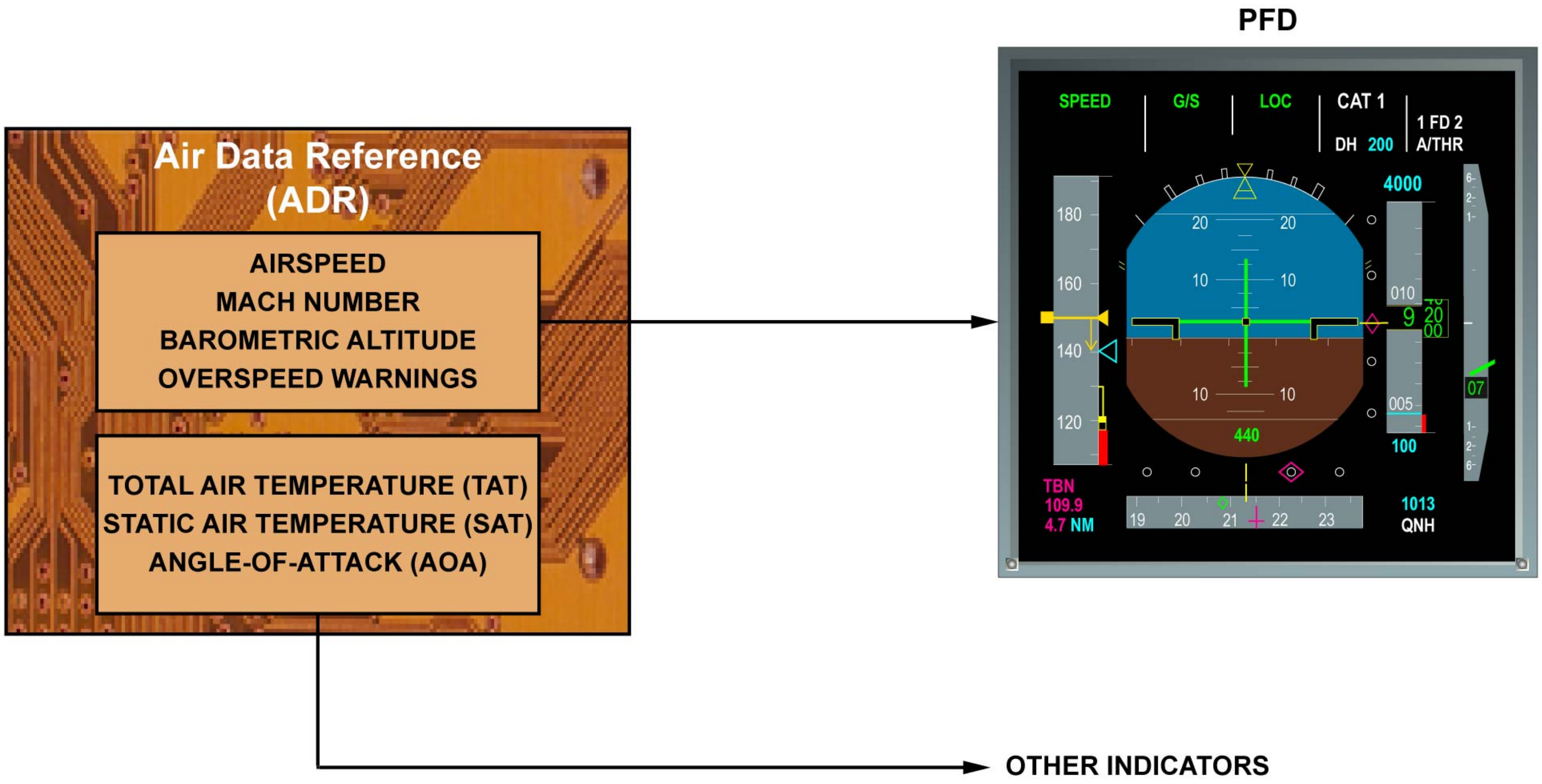
ADIRS (continued)

ADR UNIT

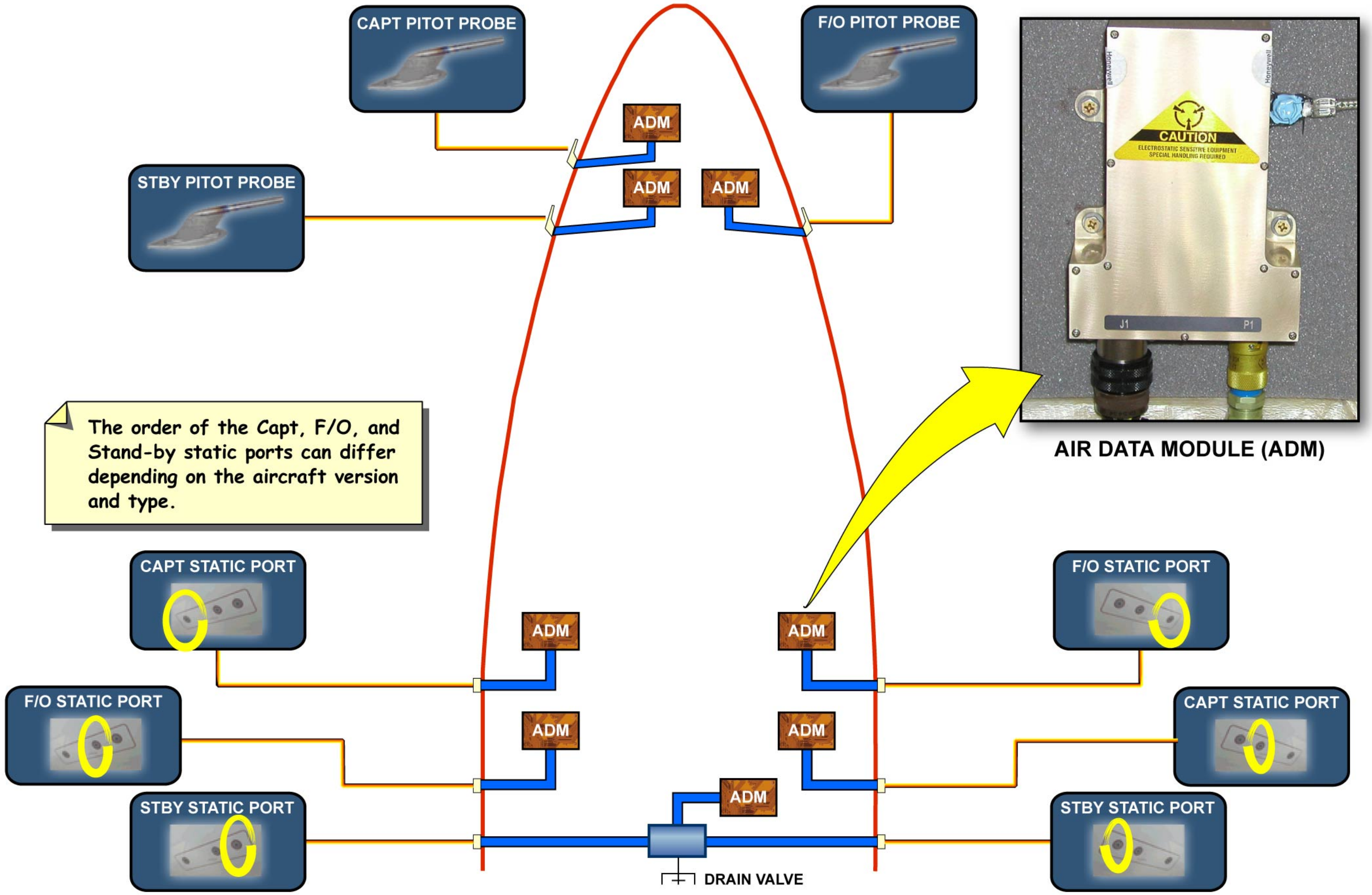
The ADR part supplies various air data to the instruments and other users:
- airspeed, mach number, barometric altitude to the PFD and over speed to the Flight Warning Computer (FWC),
- Total Air Temperature (TAT), Static Air Temperature (SAT), and Angle-Of-Attack (AOA) sensors to other indicators.

The pitot probes and the static probes are connected to 8 Air Data Modules (ADM), which convert air pressure into digital format before they send them to the ADIRUs.

NOTE: Depending on the aircraft versions and types and the A/C aerodynamic shapes (fuselage length, engines location, etc), the position of the CAPT, F/O and Stand-by static ports can differ.



ADIRS - ADR UNIT



ADIRS - ADR UNIT

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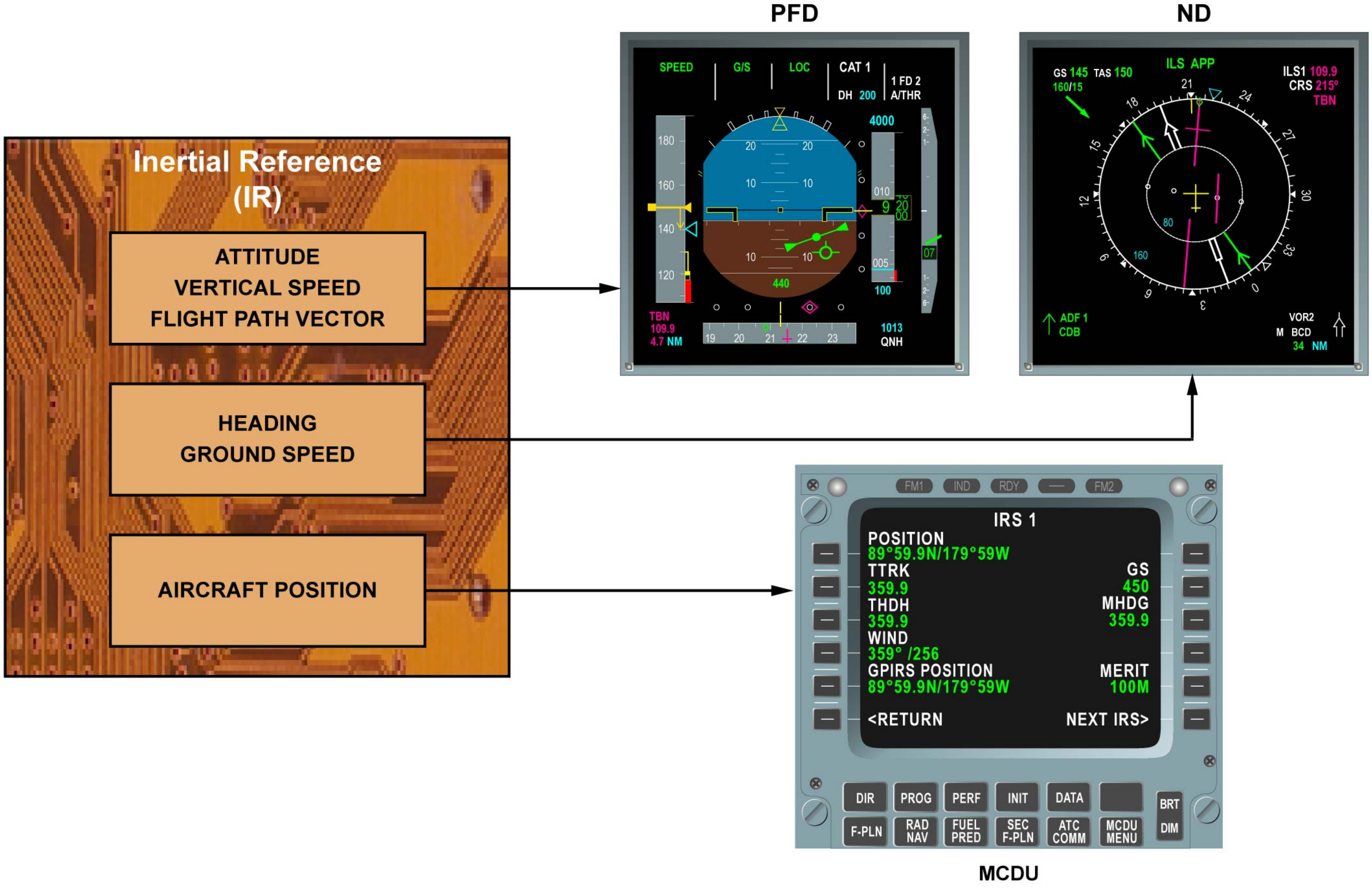
34 NAVIGATION SYSTEM PRESENTATION (1)

ADIRS (continued)

IR UNIT

The IR part gives inertial data to the EFIS, Flight Management and Guidance Envelope Computers (FMGECs) and other users:
- attitude, heading, Vertical Speed (V/S), flight path vector to the PFD,
- heading, ground speed to the ND,
- IR position to FMGECs for A/C position computation and available on the MCDU DATA page.

G6B08031 - G10T4T0 - FM34PB000000001



ADIRS - IR UNIT

34 NAVIGATION SYSTEM PRESENTATION (1)

ADIRS (continued)

ADIRS CONTROL

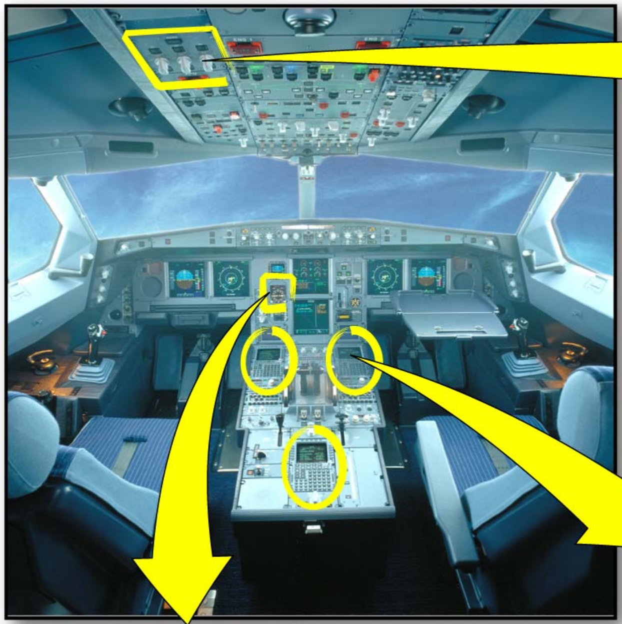
The three ADIRUs are controlled through the single ADIRS Mode Selector Unit (MSU) located on the overhead panel. The initialization of the ADIRUs is normally done through MCDU.

NOTE: An optional auto alignment by GPS is available with the latest version of the Flight Management System (FMS).

ADIRS INDICATING ON DDRMI

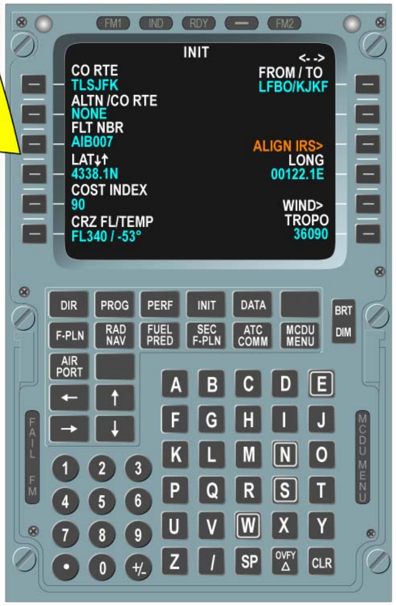
ADIRS supplies heading information to the DDRMI.

View of the A330,
the location is identical for the A340.



AIR DATA/INERTIAL REFERENCE UNIT (ADIRS)
MODE SELECTOR UNIT (MSU).

DIGITAL DISTANCE
AND RADIO MAGNETIC
INDICATOR (DDRMI) (311VU)



MCDU

The Air Data/Inertial Reference Units (ADIRUs) can be automatically aligned by Global Positioning System (GPS) as an option.

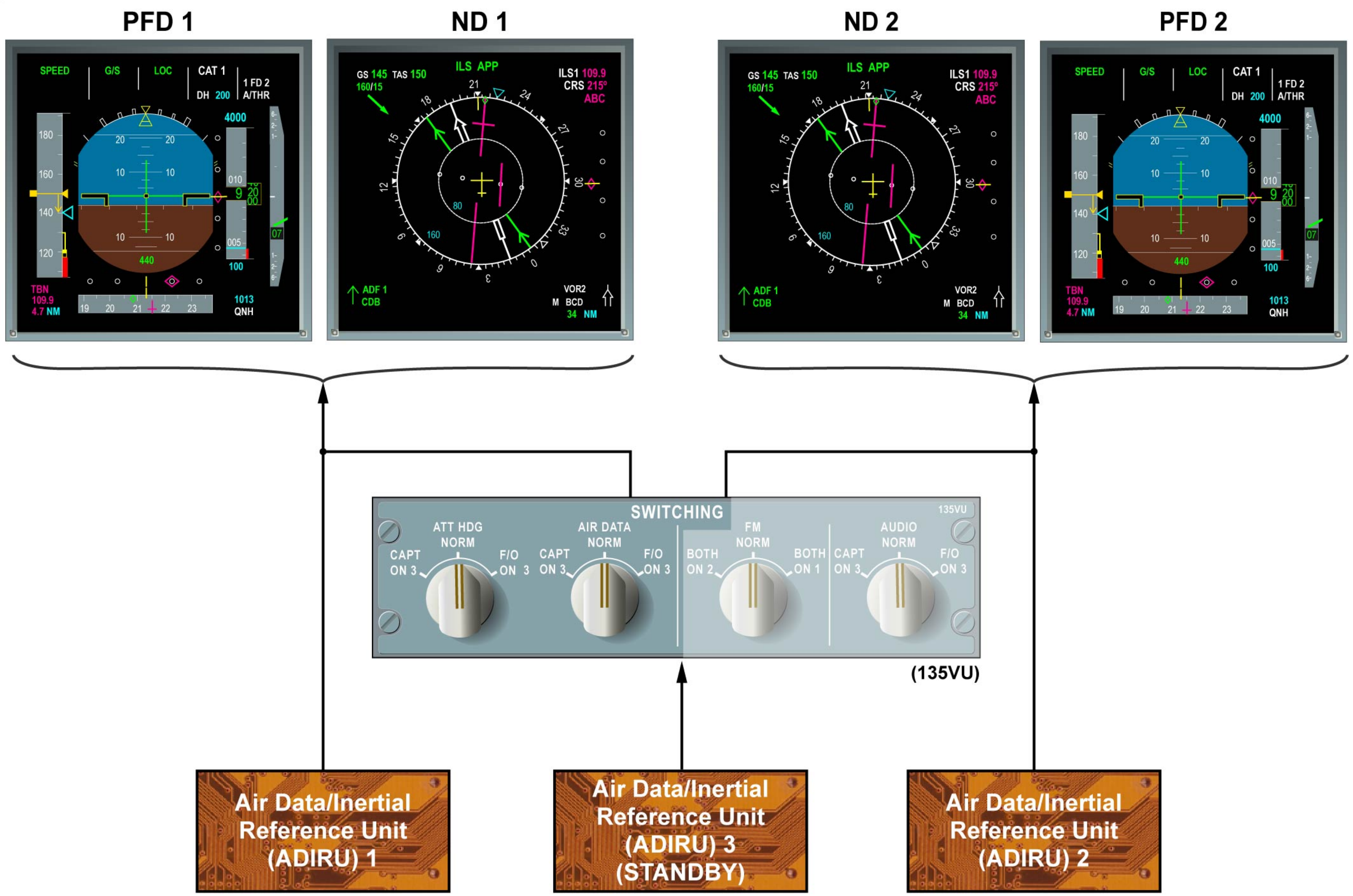
ADIRS - ADIRS CONTROL & ADIRS INDICATING ON DDRMI

34 NAVIGATION SYSTEM PRESENTATION (1)

ADIRS (continued)

PFD AND ND INDICATING

ADIRU 1 supplies the CAPT PFD and ND, and ADIRU 2 supplies the F/O PFD and ND. For EFIS displays, ADIRU 3 is used as a hot spare, and can be switched via the switching panel to replace either ADIRU 1 or ADIRU 2.



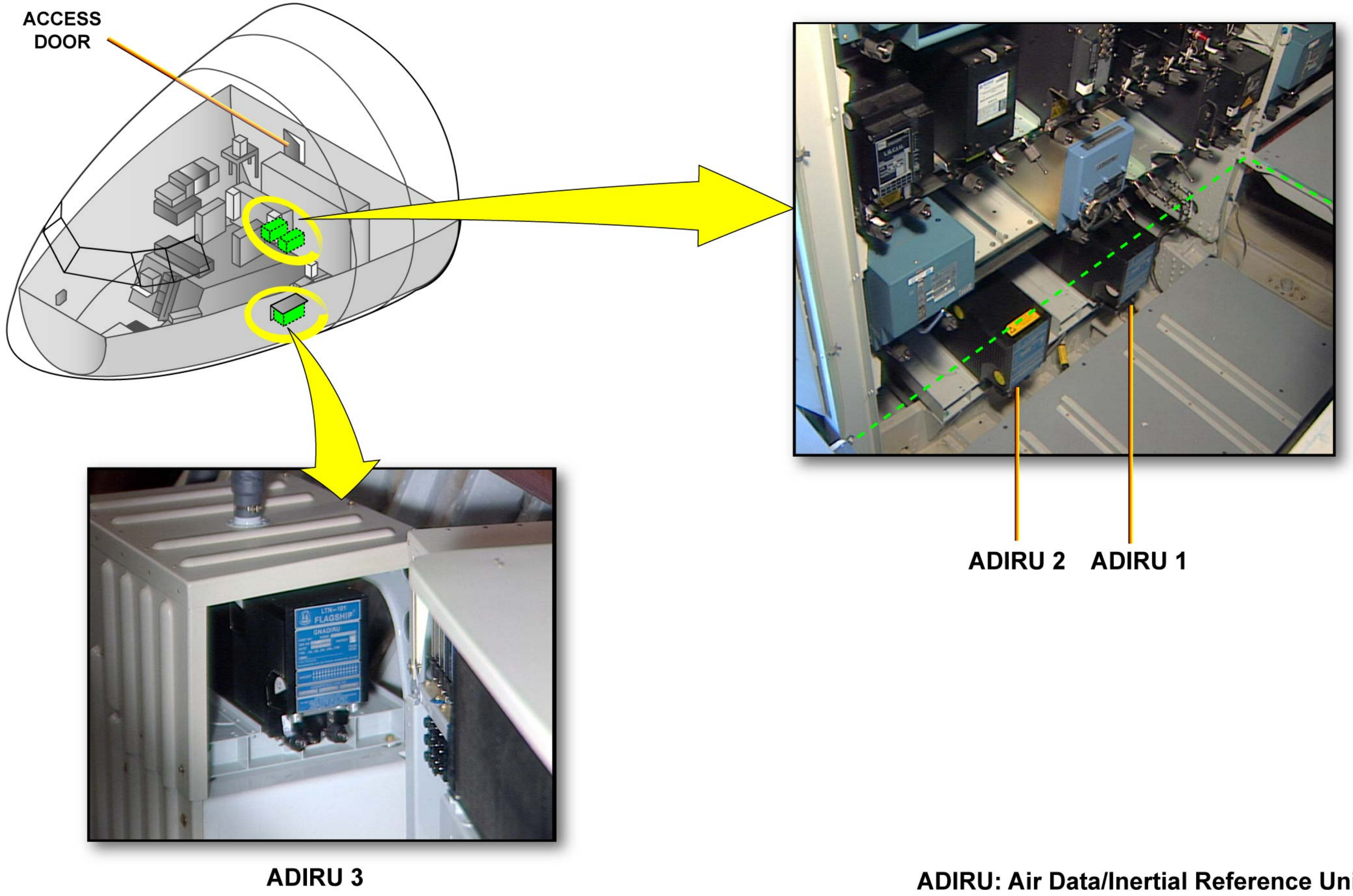
ADIRS - PFD AND ND INDICATING

34 NAVIGATION SYSTEM PRESENTATION (1)

ADIRS (continued)

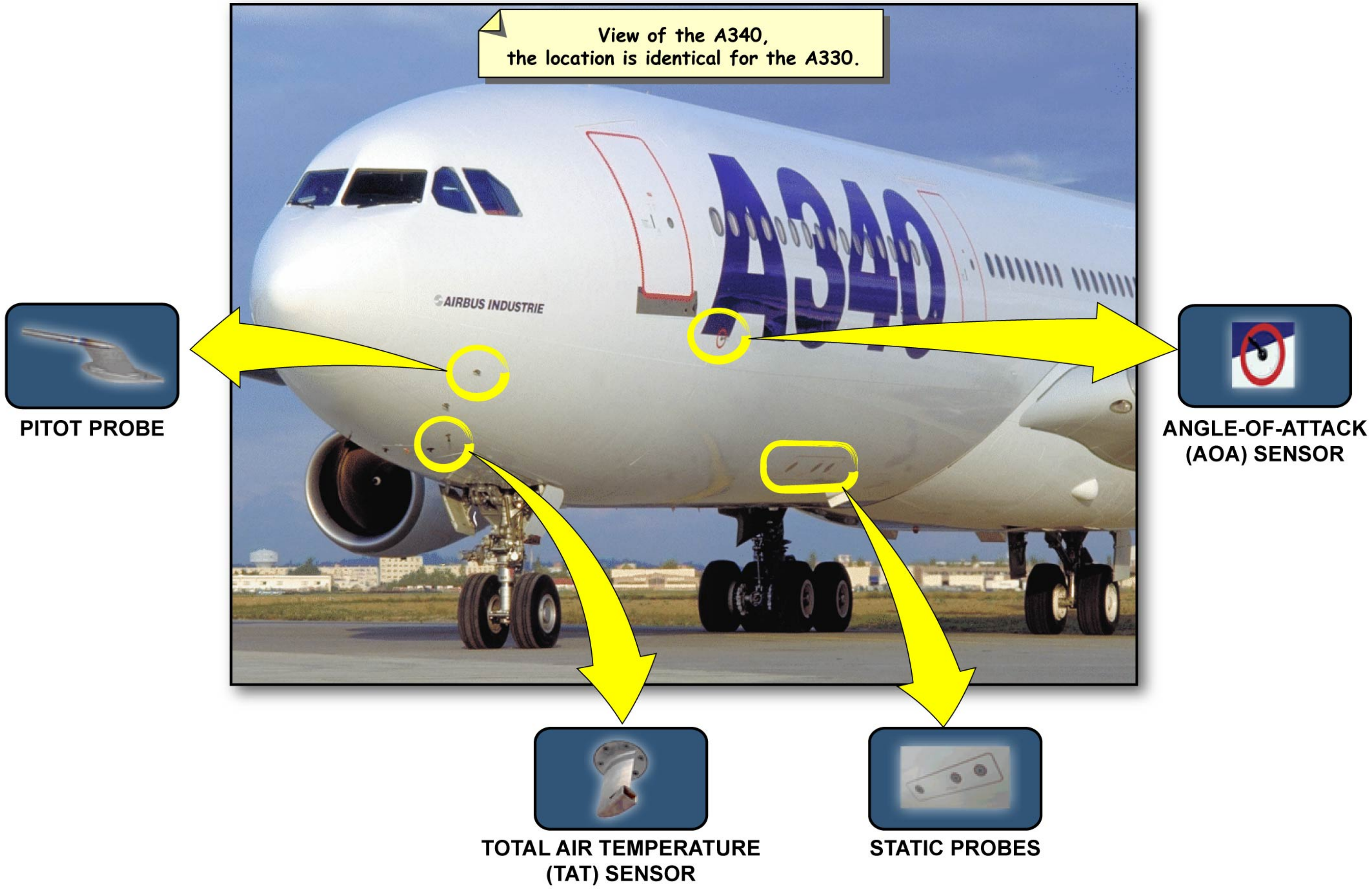
COMPONENT LOCATION

The 3 ADIRUs are installed in the avionics compartment.
The pitot probes, the static ports, the AOA and the TAT sensors are located on the nose and the forward fuselage.



ADIRU: Air Data/Inertial Reference Unit

ADIRS - COMPONENT LOCATION



ADIRS - COMPONENT LOCATION

G6B08031 - G10T4T0 - FM34PB000000001

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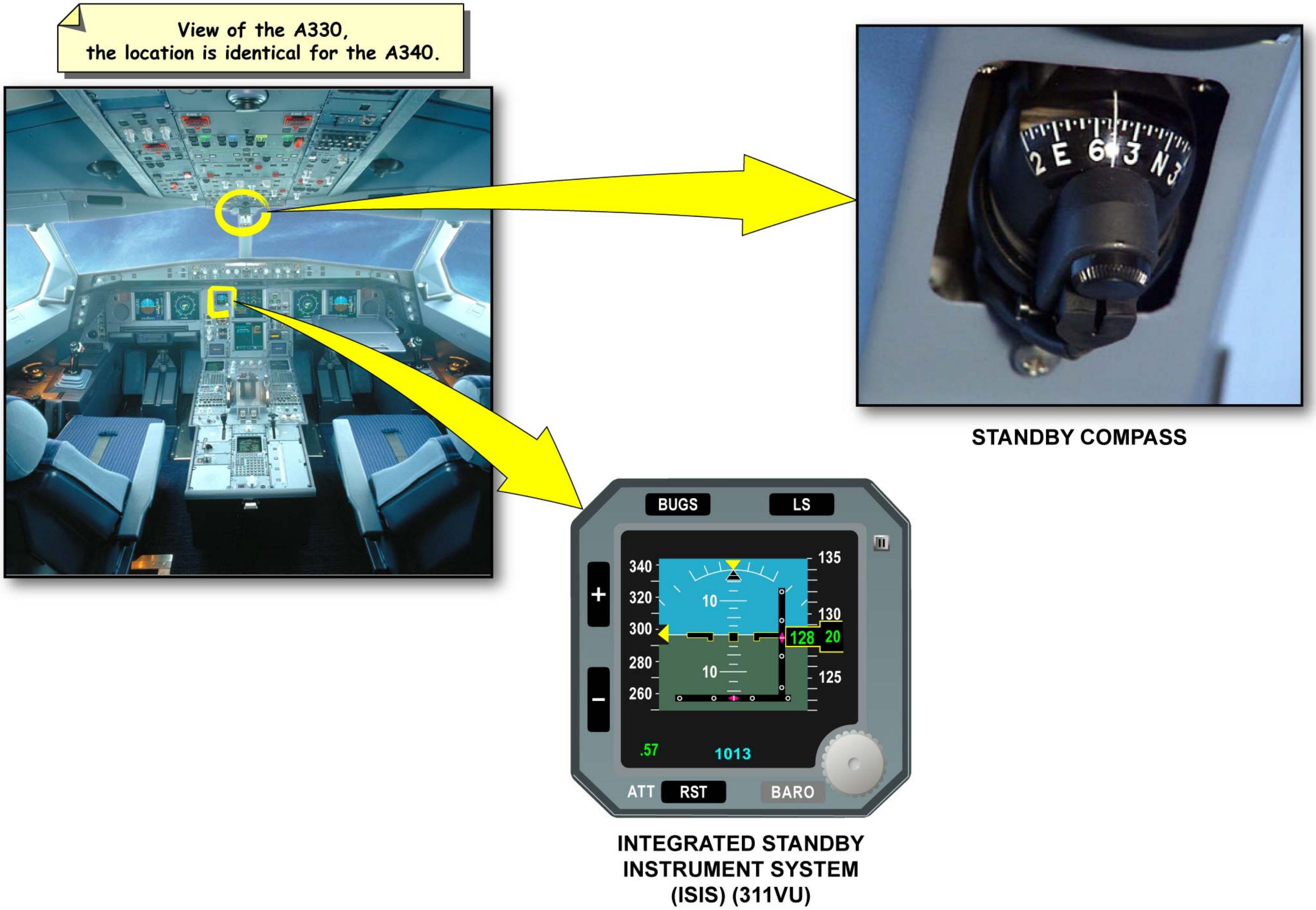
34 NAVIGATION SYSTEM PRESENTATION (1)

STANDBY INSTRUMENTS

The integrated standby instrument system, called ISIS, is installed on the main instrument panel. It provides the following functions: standby horizon, standby altimeter and standby airspeed indicator. The ISIS is also capable of displaying heading and ILS information. A standby compass is installed just below the overhead panel.



STANDBY INSTRUMENTS

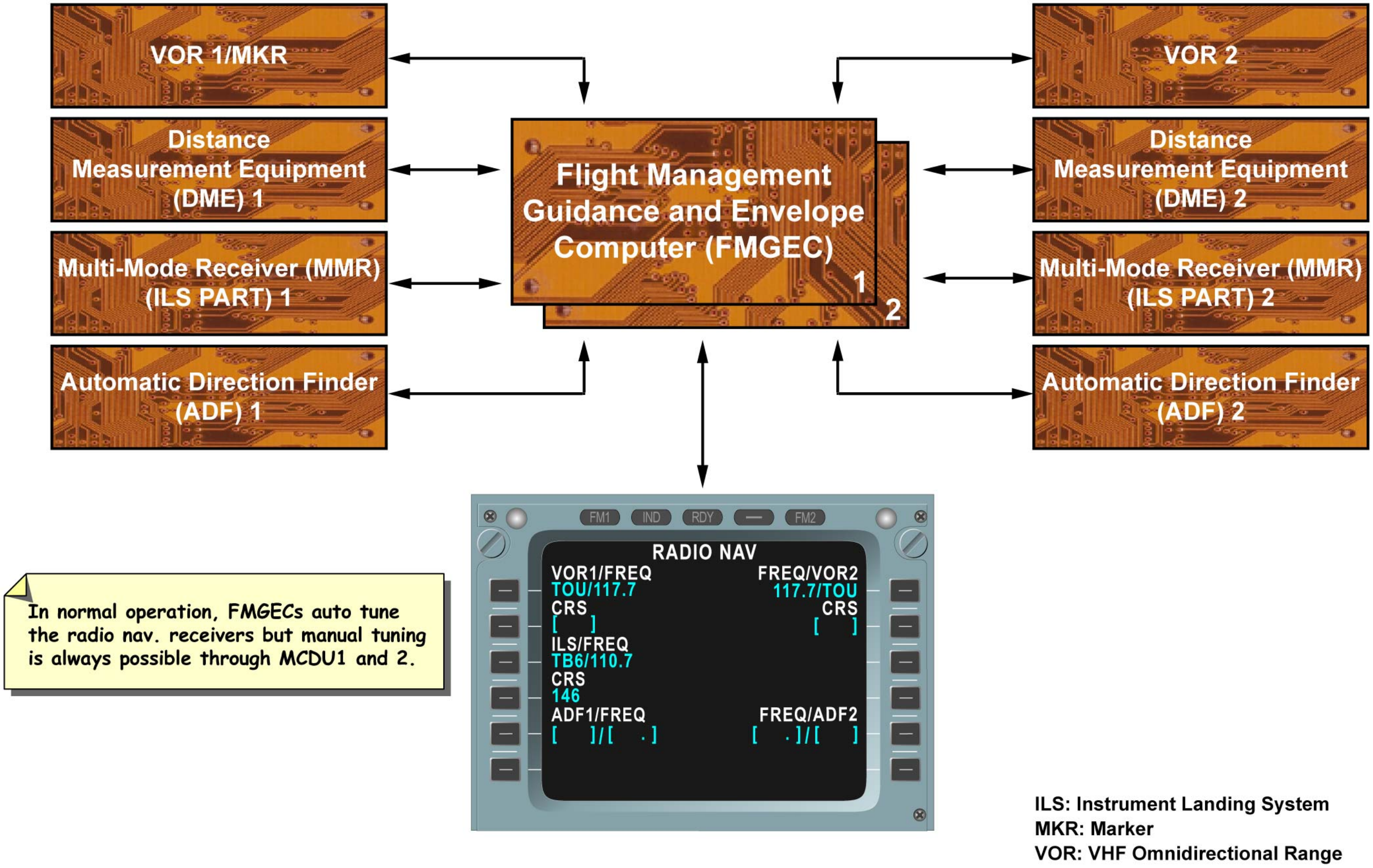
G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

RADIO NAVIGATION CONTROL

NORMAL TUNING

Normally, the FMGECs tune the radio navigation receivers automatically for display and for A/C position computation. The station information (frequency, identification and coordinates) come from the navigation database loaded in the FMGECs. Access to the MCDU RADIO NAV page lets the crew manually tune the radio navigation receivers, via the FMGECs.



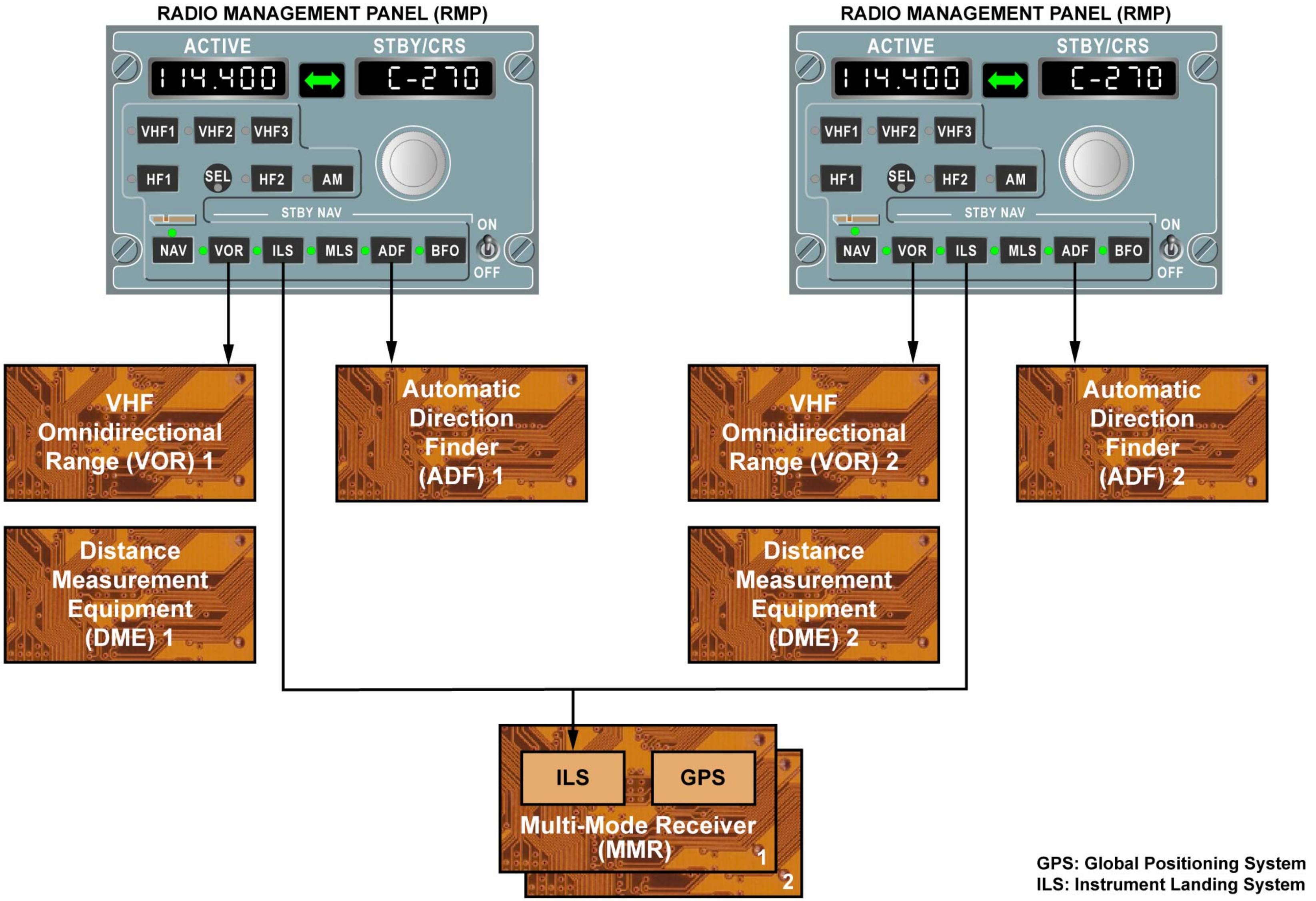
RADIO NAVIGATION CONTROL - NORMAL TUNING

34 NAVIGATION SYSTEM PRESENTATION (1)

RADIO NAVIGATION CONTROL (continued)

BACKUP TUNING

If both FMGECs have failed or if all MCDUs have failed and manual tuning is needed by the crew, the Radio Management Panel (RMP) 1 and 2 are capable of tuning their own side navigation receivers in backup mode.



RADIO NAVIGATION CONTROL - BACKUP TUNING

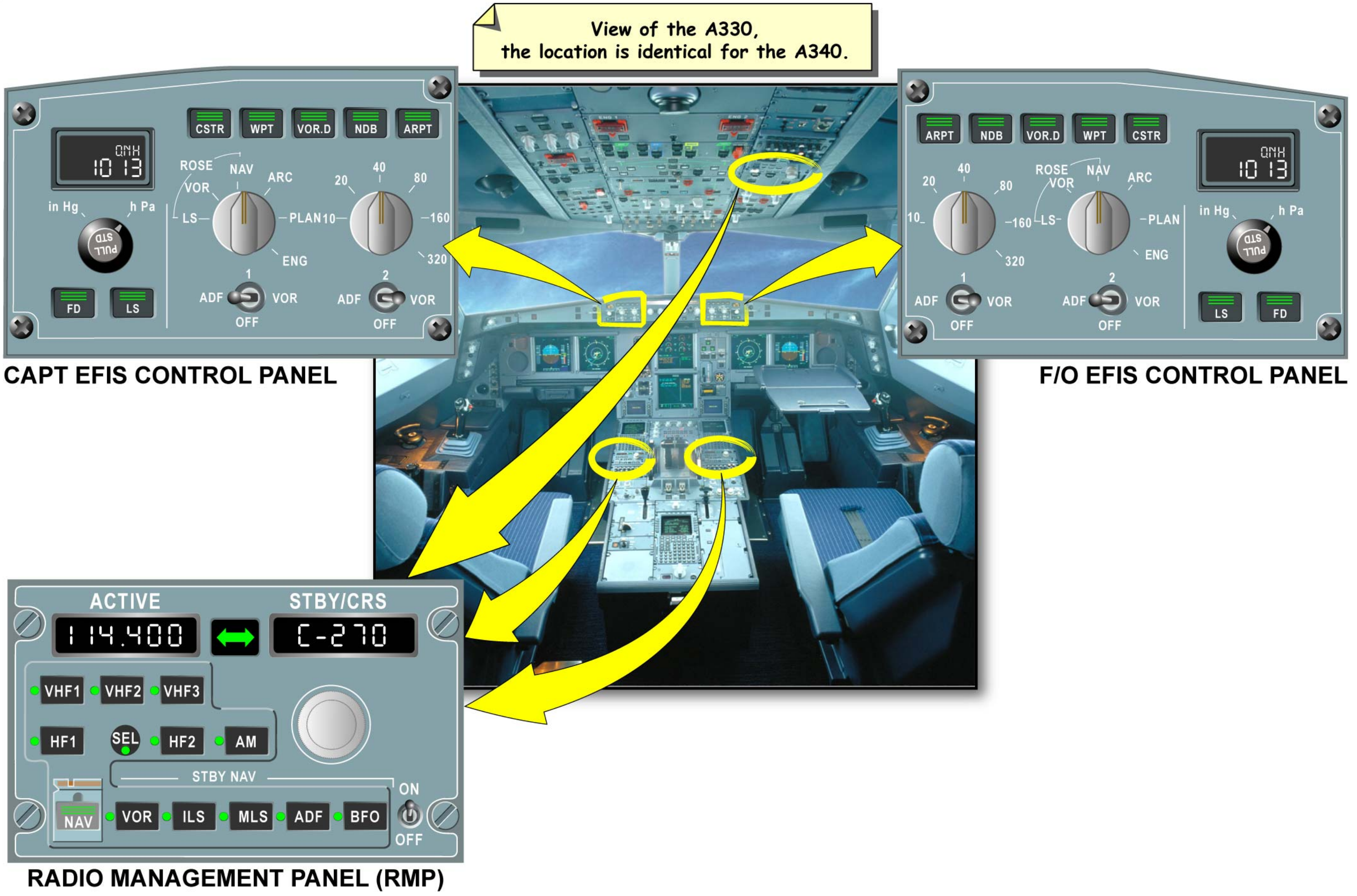
G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

RADIO NAVIGATION CONTROL (continued)

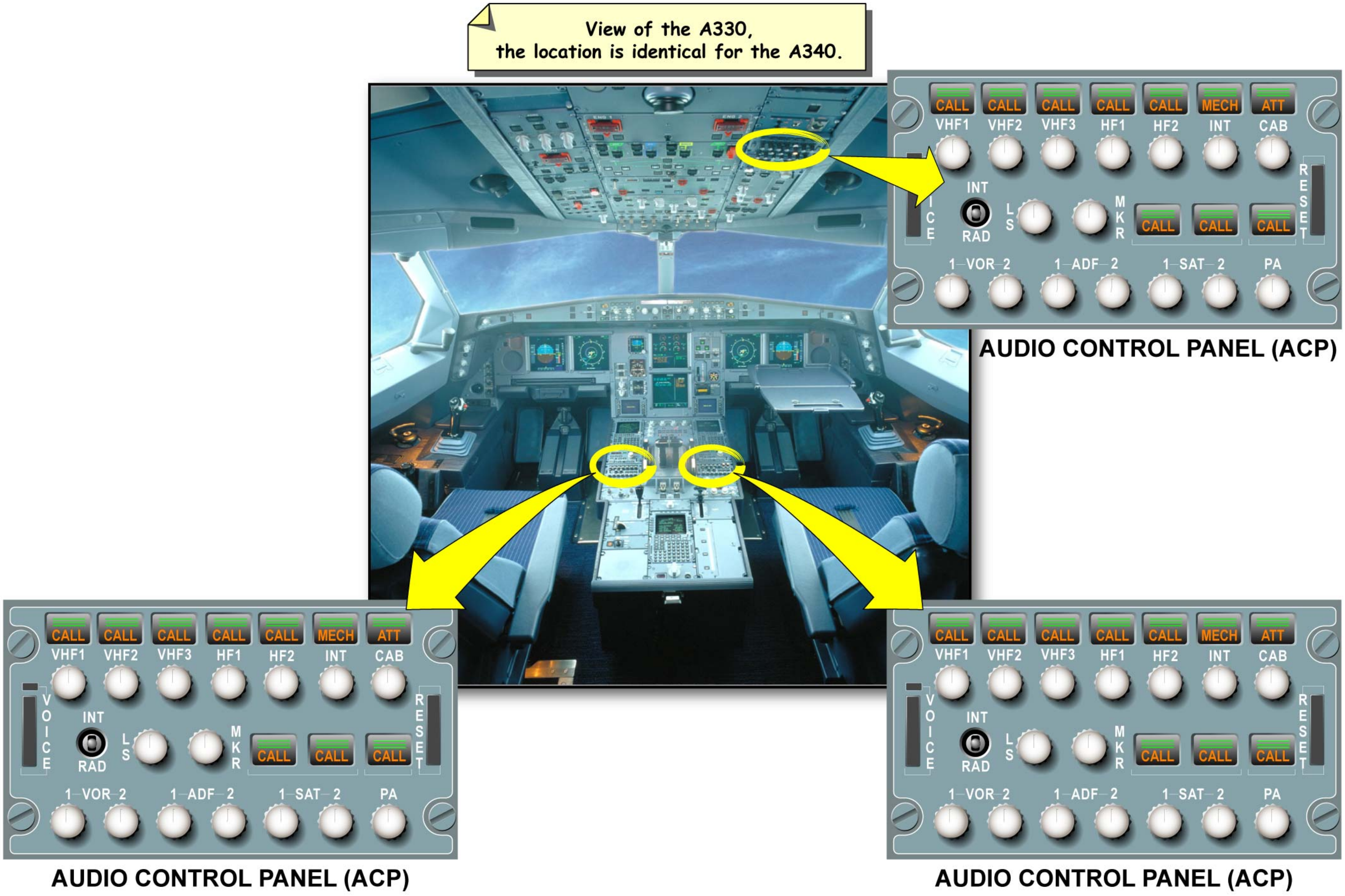
LOCATION

The EFIS control panel mode switches control what type of information is shown to the flight crew on the ND. They are located on either sides of the glareshield. The toggle switches on the EFIS control panel enable the display of the VOR or ILS pointers on the ND. RMPs are located on the center pedestal.
The radio navigation audio signals can be heard by the crew according to the Audio Control Panels (ACPs) manual selection. Two ACPs are located on the center pedestal, a third one on the overhead panel. The third occupant ACP can be used by the CAPT or F/O to replace a faulty ACP. A manual switching is then required.



RADIO NAVIGATION CONTROL - LOCATION

G6B08031 - G10T4T0 - FM34PB0000000001



RADIO NAVIGATION CONTROL - LOCATION

G6B08031 - G10T4T0 - FM34PB000000001

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34 NAVIGATION SYSTEM PRESENTATION (1)

RADIO NAVIGATION CONTROL (continued)

NAVIGATION DISPLAY MODES

There are five different navigation display modes that can be selected via the EFIS control panels. These modes are the PLAN, ARC, NAV, VOR, and ILS modes.

ILS MODE

VOR MODE

NAV MODE

EFIS CONTROL PANEL

ARC MODE

PLAN MODE

RADIO NAVIGATION CONTROL - NAVIGATION DISPLAY MODES

G6B08031 - G10T4T0 - FM34PB000000001

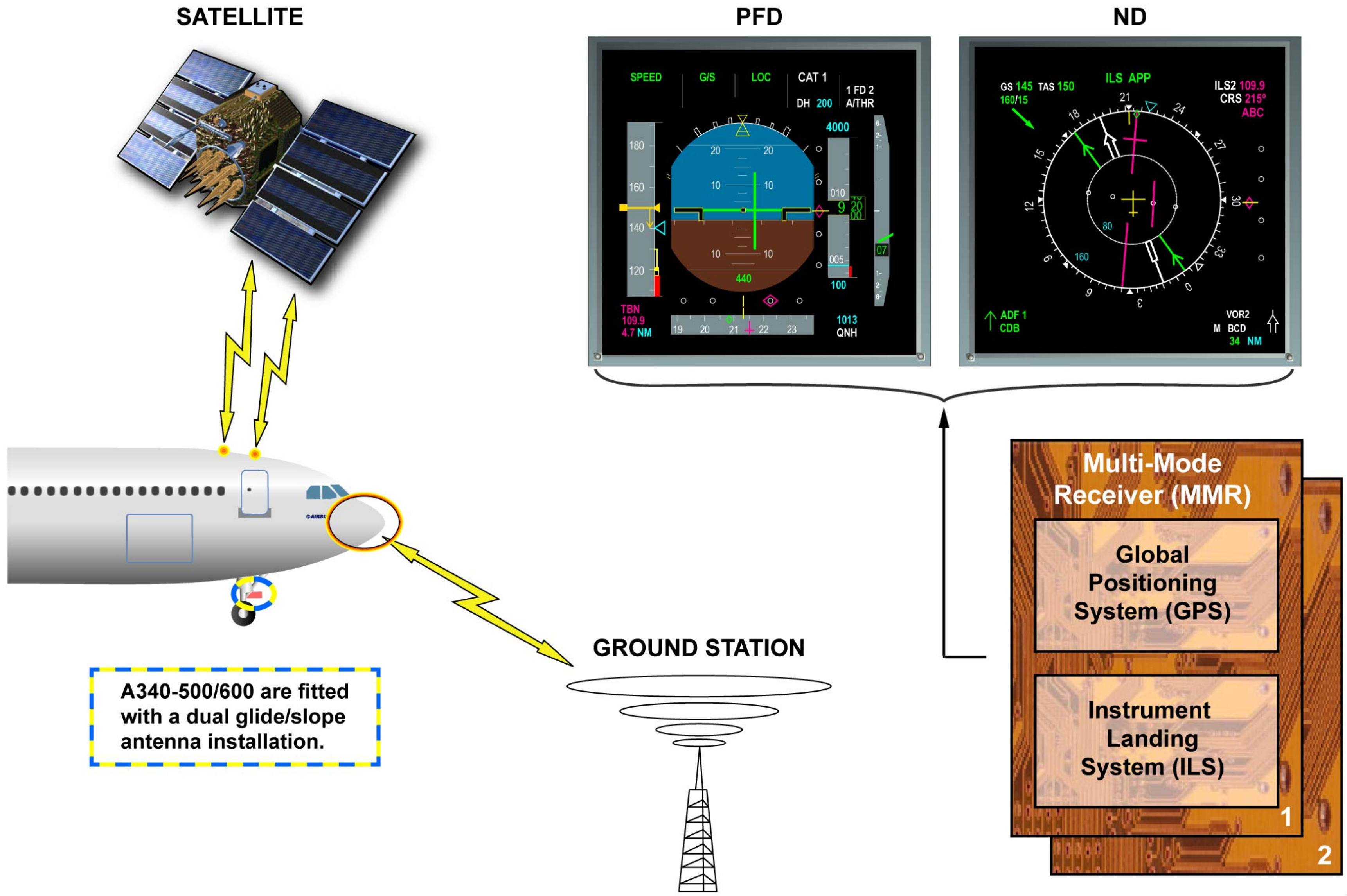
34 NAVIGATION SYSTEM PRESENTATION (1)

MMR

GENERAL

The aircraft has two Multi Mode Receivers (MMRs). The MMR is a single navigation receiver that includes two internal receivers:
- an ILS receiver,
- a GPS receiver.

The primary function of the MMR is to receive and process ILS and GPS signals.


SATELLITE
PFD
ND
A340-500/600 are fitted with a dual glide/slope antenna installation.
GROUND STATION
Multi-Mode Receiver (MMR)
Global Positioning System (GPS)
Instrument Landing System (ILS)
1
2

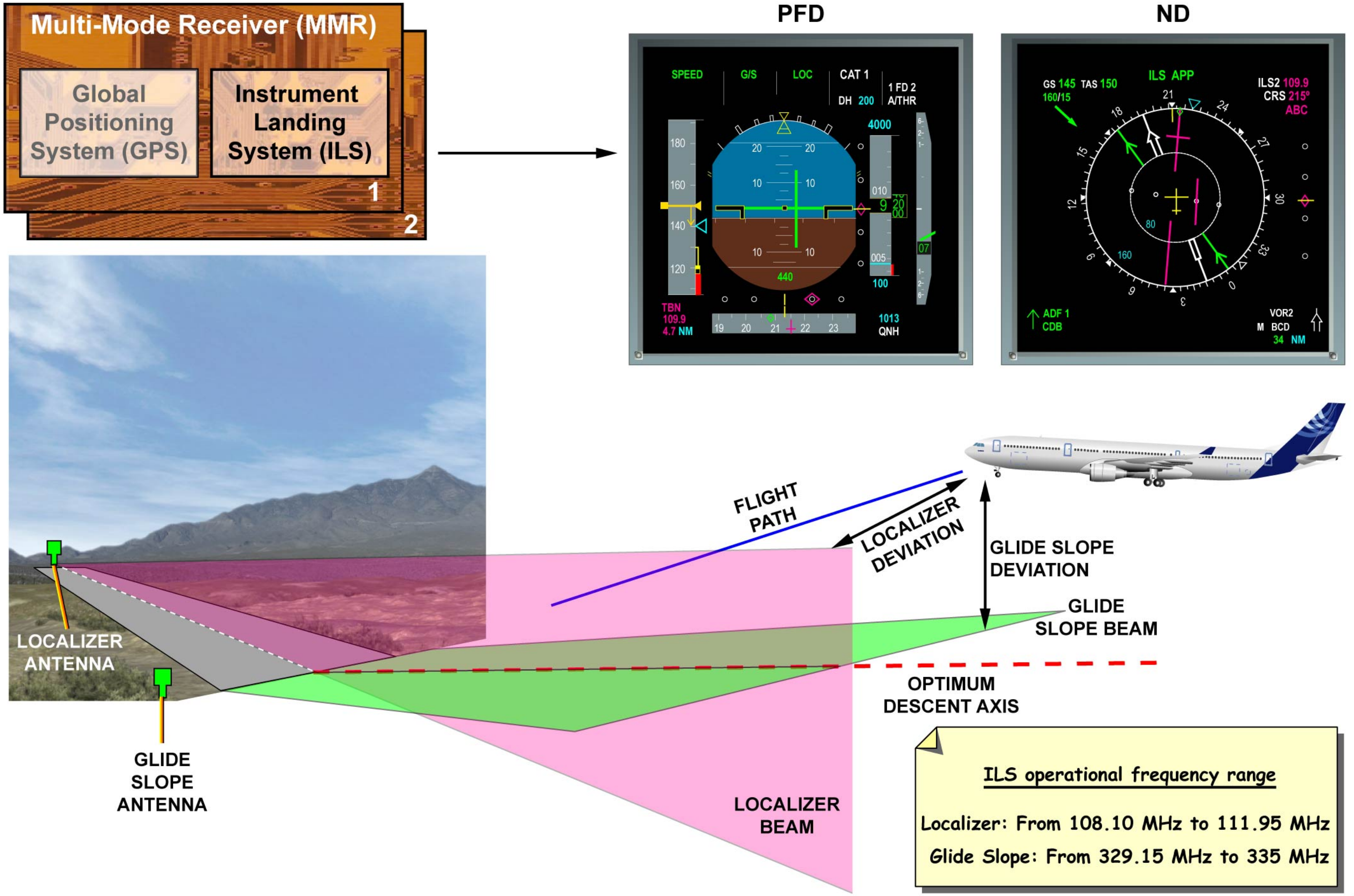
MMR - GENERAL

34 NAVIGATION SYSTEM PRESENTATION (1)

MMR (continued)

ILS PRINCIPLE

The ILS has ground stations sending information to the crew and aircraft systems to guide the A/C along a predetermined flight path for the landing phase. The airborne ILS receiver measures and displays angular deviations with respect to this predetermined flight path and decodes the morse audio signal, which identifies the ground station. A descent axis is determined by the intersection of a localizer beam (LOC) and a Glide Slope beam (G/S) generated by the ground stations.



MMR - ILS PRINCIPLE

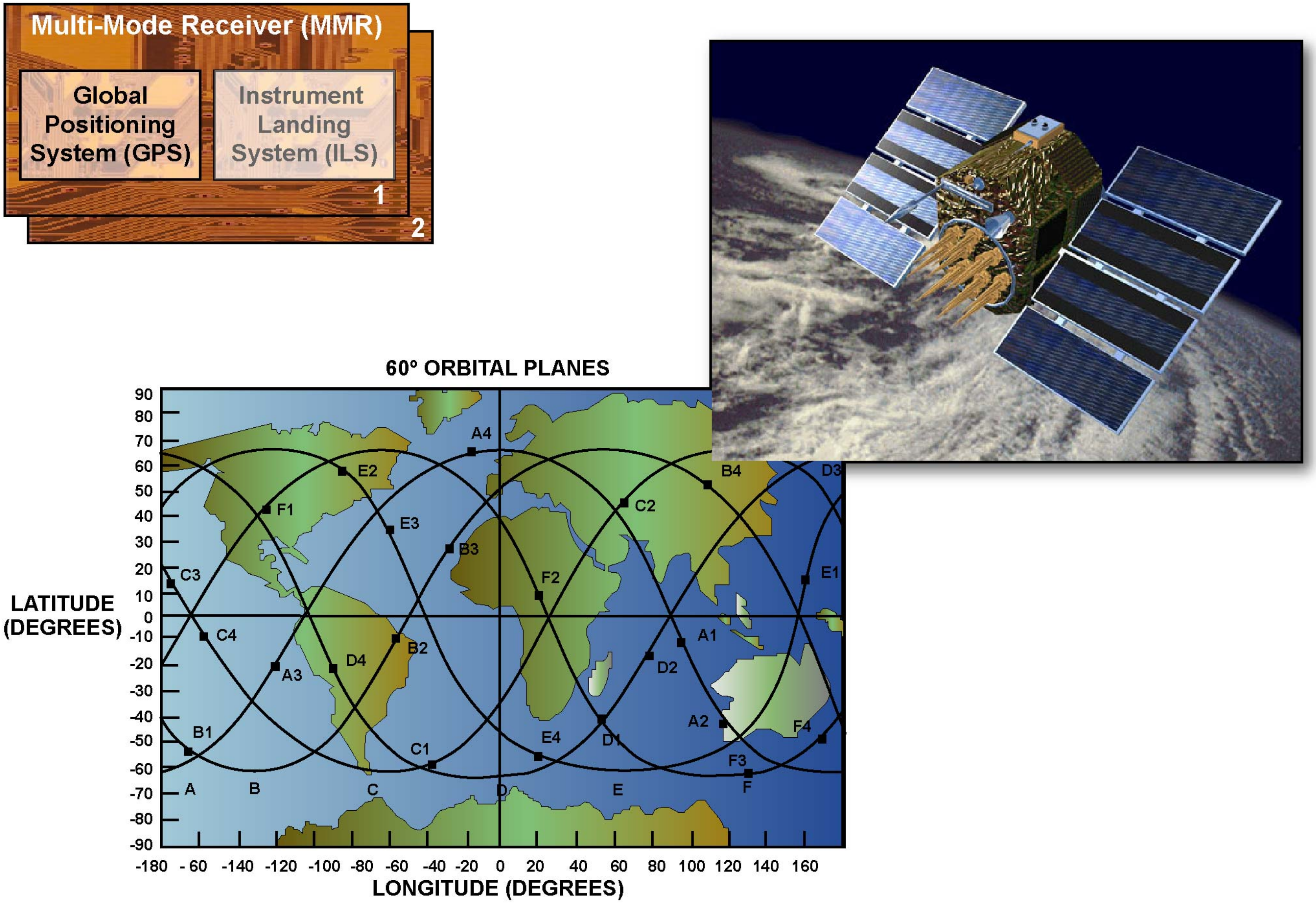
G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

MMR (continued)

GPS PRINCIPLE

The GPS is a worldwide navigation radio aid that uses signals broadcasted by a constellation of 24 orbital satellites, which provide accurate time information. The receiver then processes the signal into accurate position and time through triangulation of the signals broadcasted by the satellites. Four monitor stations and one master control station track the satellites, compute the position and clock correction and transmit updates to the satellites. This information is then down linked to the GPS receivers for accurate calibration of the receiver clock to match the clock in the satellite.



MMR - GPS PRINCIPLE

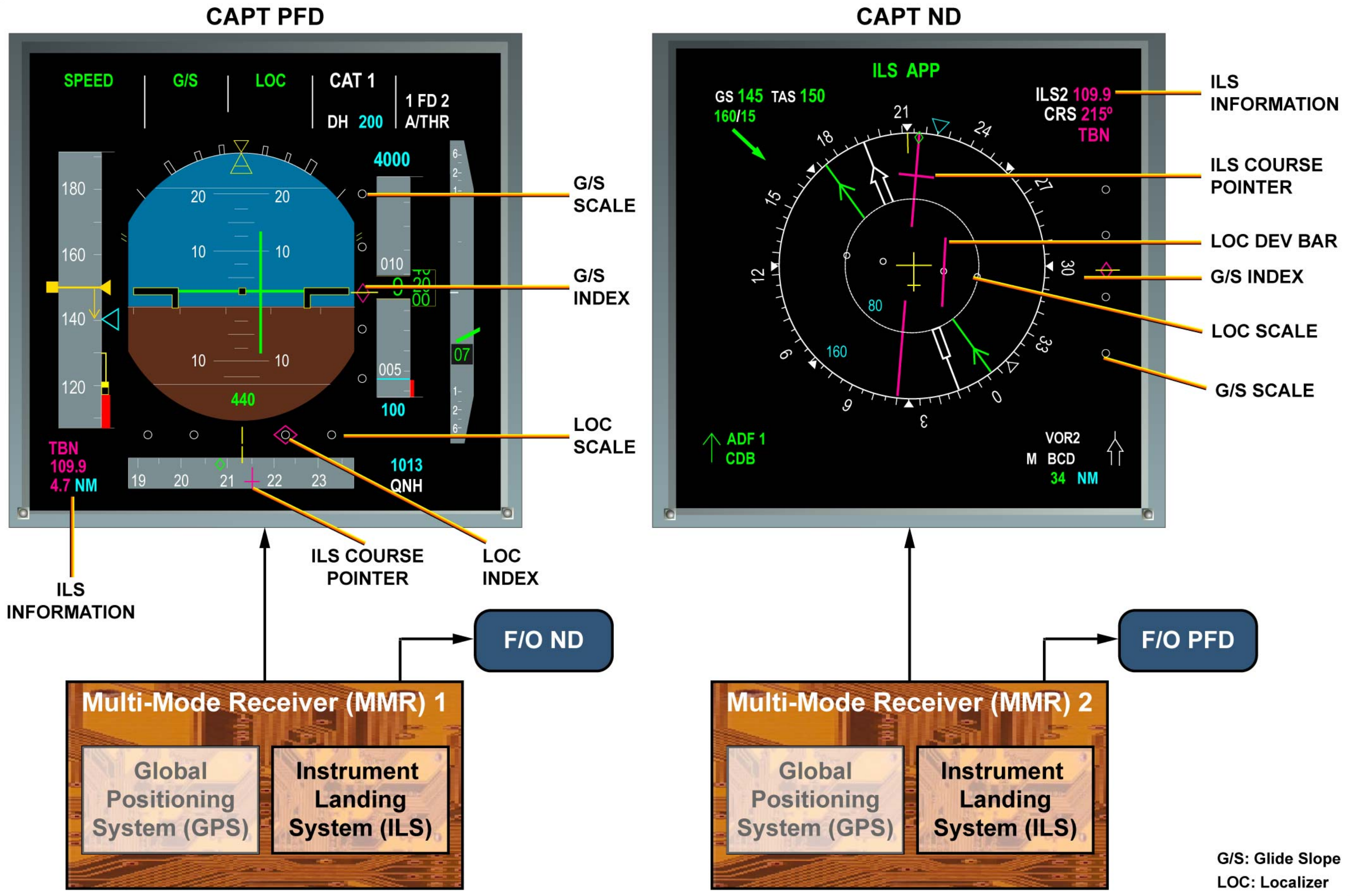
G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

MMR (continued)

ILS INDICATING

The ILS data is sent to the displays through the Display Management Computers (DMCs). The ILS 1 data is sent to the CAPT PFD and F/O ND, while the ILS 2 data is sent to the F/O PFD and CAPT ND.



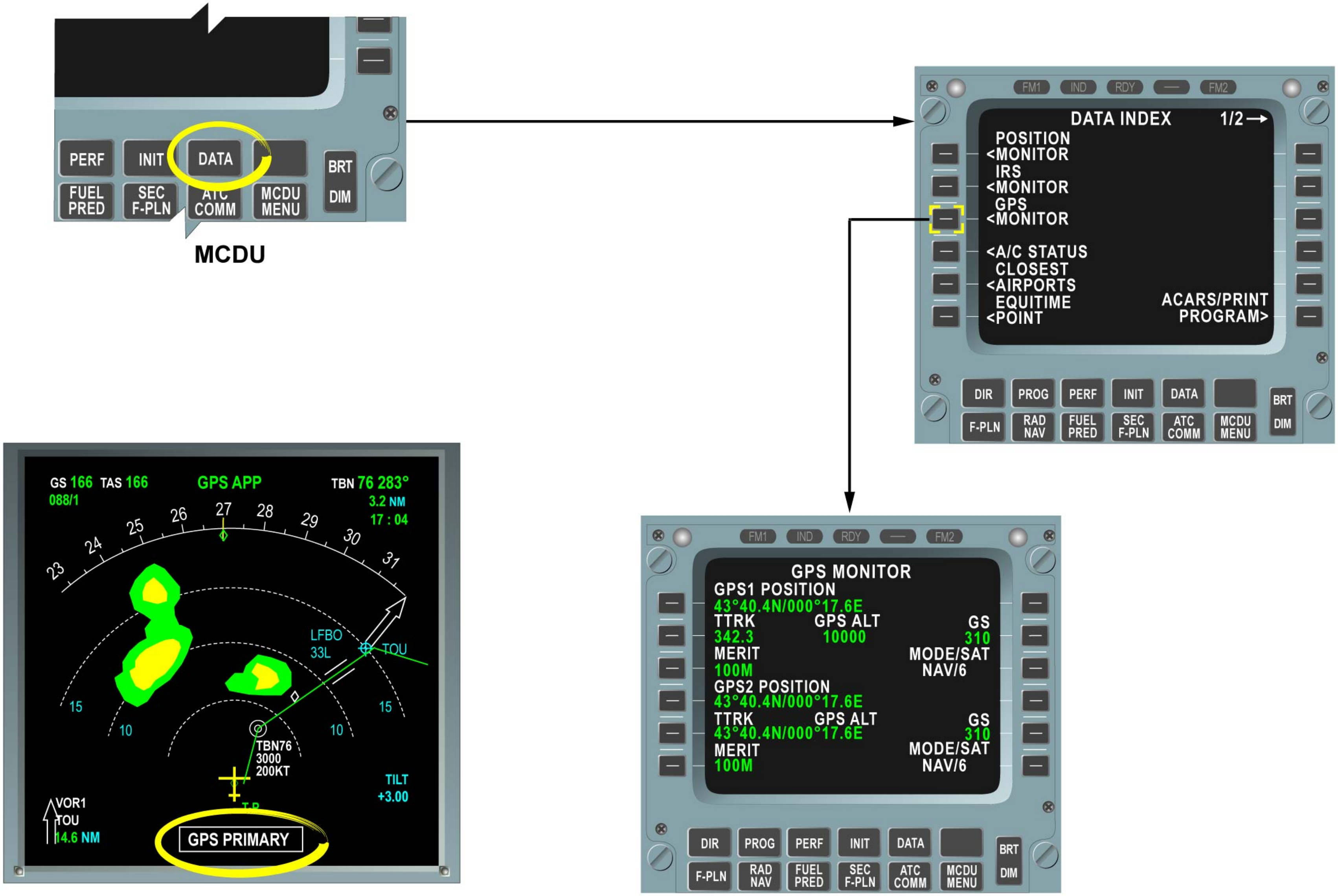
MMR - ILS INDICATING

34 NAVIGATION SYSTEM PRESENTATION (1)

MMR (continued)

GPS INDICATING

The GPS data is accessible on the MCDU. Selecting DATA page P/B on the MCDU and then the GPS MONITOR line select key, will give the information related to the GPS receivers. GPS when receiving adequate signals to calculate a present position will be written at the bottom of the ND. This is displayed as "GPS PRIMARY".



MMR - GPS INDICATING

G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

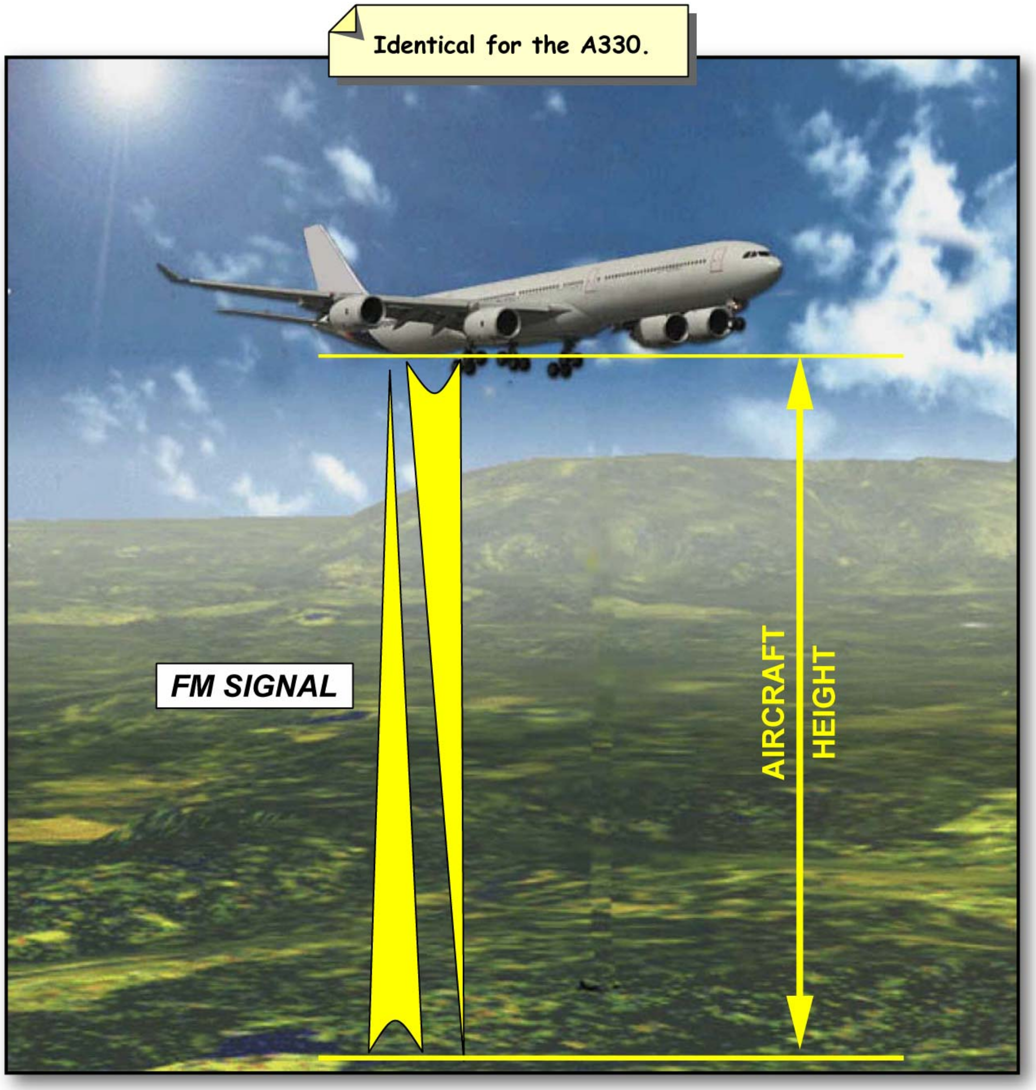
RADIO ALTIMETER

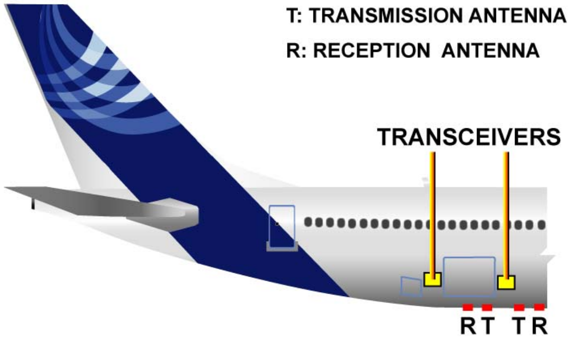
PRINCIPLE

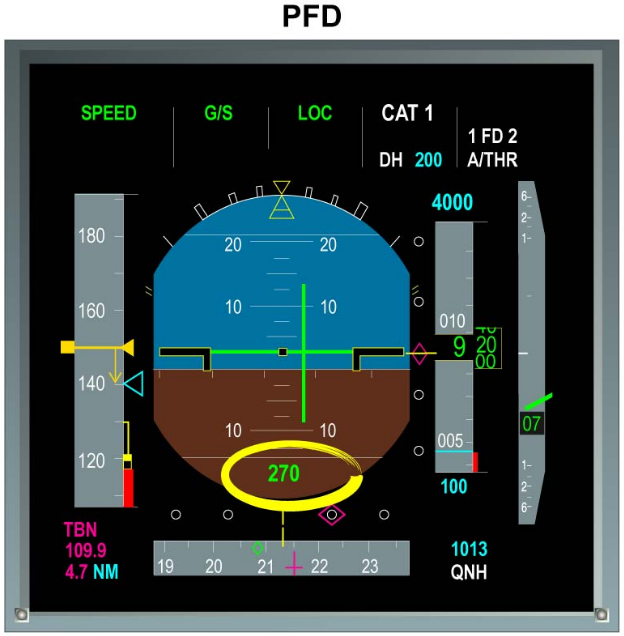
The RA system determines the height of the aircraft above the terrain and displays it below 2.500 ft. The principle of the RA is to transmit a frequency modulated signal, from the aircraft to the ground, and to receive the ground reflected signal. The time between the transmission and the reception of the RA signal is proportional to the aircraft height.

COMPONENT LOCATION

The RA components are two transceivers, two transmission antennae and two reception antennae. The RA transceiver 1 is located in front of the cargo compartment door and the RA transceiver 2 at the rear of the cargo compartment door. The antennae are located at the bottom of the fuselage.







RADIO ALTIMETER - PRINCIPLE & COMPONENT LOCATION

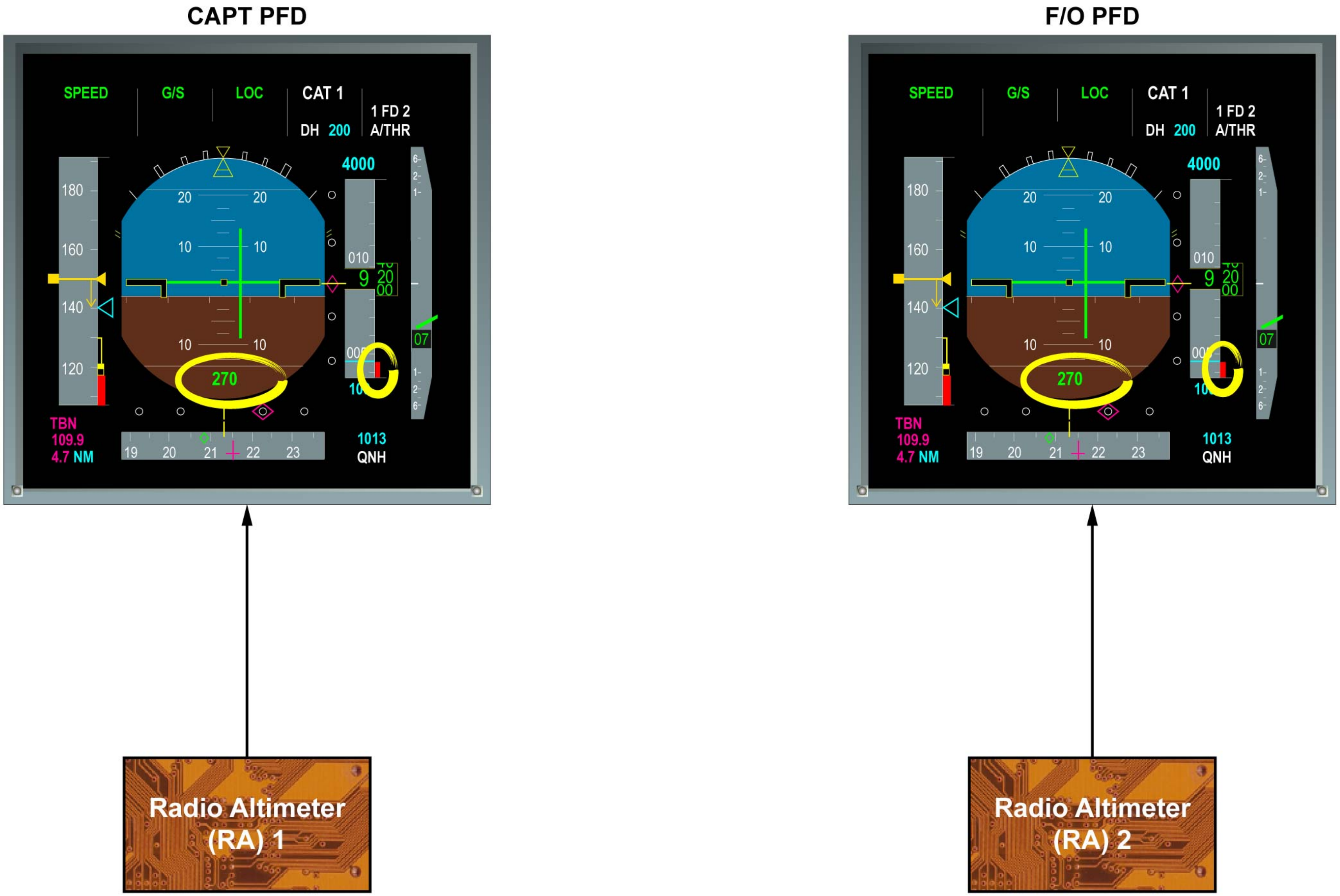
34 NAVIGATION SYSTEM PRESENTATION (1)

RADIO ALTIMETER (continued)

INDICATING

The aircraft height data is shown on the lower part of the PFD. RA data is supplied to several users and is displayed on both PFDs at all times below 2.500 ft Above Ground Level (AGL). In normal operation, the RA 1 height is displayed on the CAPT PFD and RA 2 height on the F/O PFD.

G6B08031 - G10T4T0 - FM34PB000000001



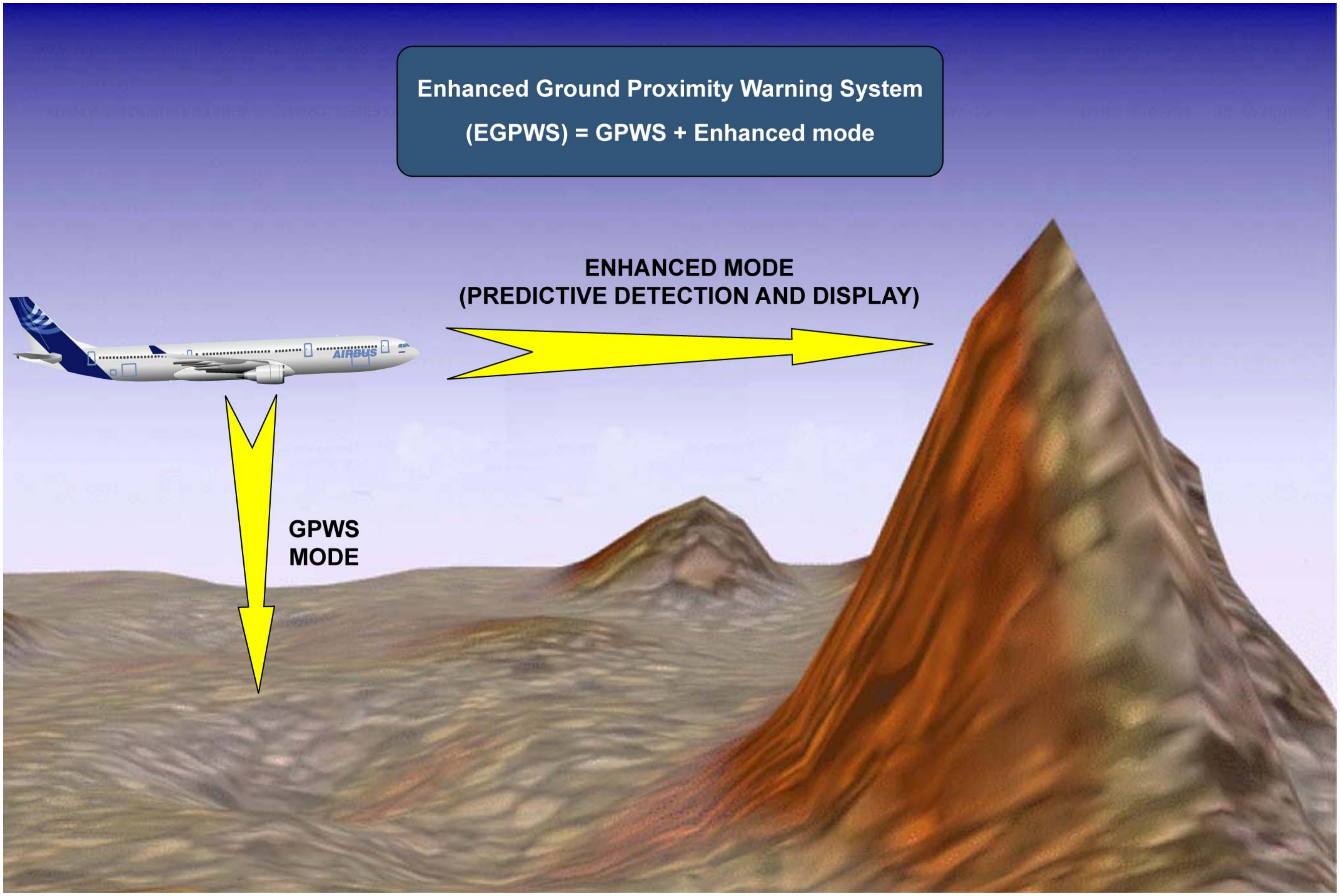
RADIO ALTIMETER - INDICATING

34 NAVIGATION SYSTEM PRESENTATION (1)

EGPWS

PRINCIPLE

The function of the EGPWS is to generate aural and visual warnings if the A/C adopts a potentially hazardous configuration of Controlled Flight Into Terrain (CFIT). This system has five basic Ground Proximity Warning System (GPWS) modes. The enhanced function has 2 terrain modes called Terrain Clearance Floor (TCF) function, which increases the terrain clearance envelope around the airport runway, and the Terrain Awareness alerting and Display (TAD) function, which incorporates a terrain database to predict conflict between flight path and terrain and to display the conflicting terrain.



EGPWS - PRINCIPLE

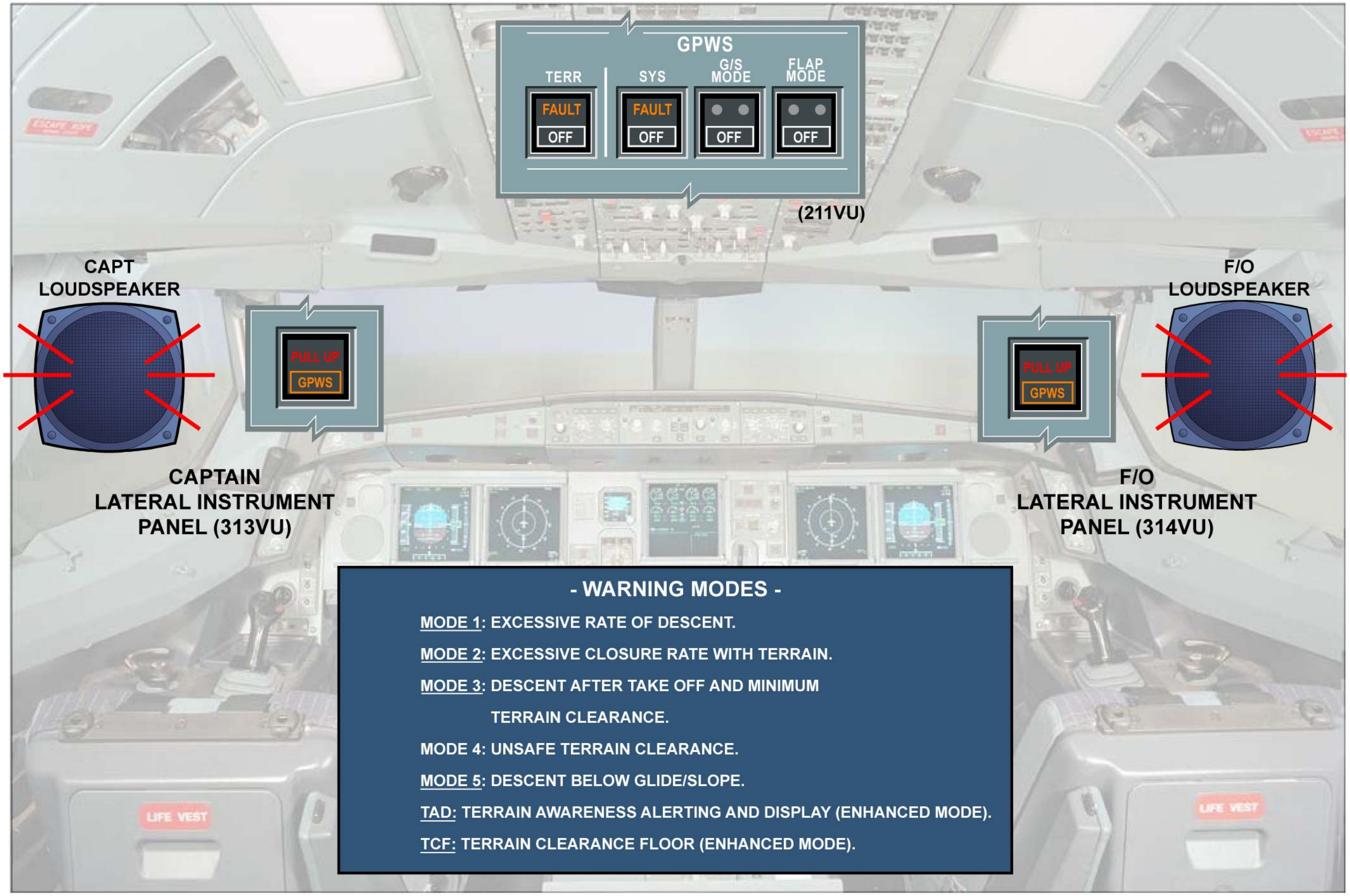
G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

EGPWS (continued)

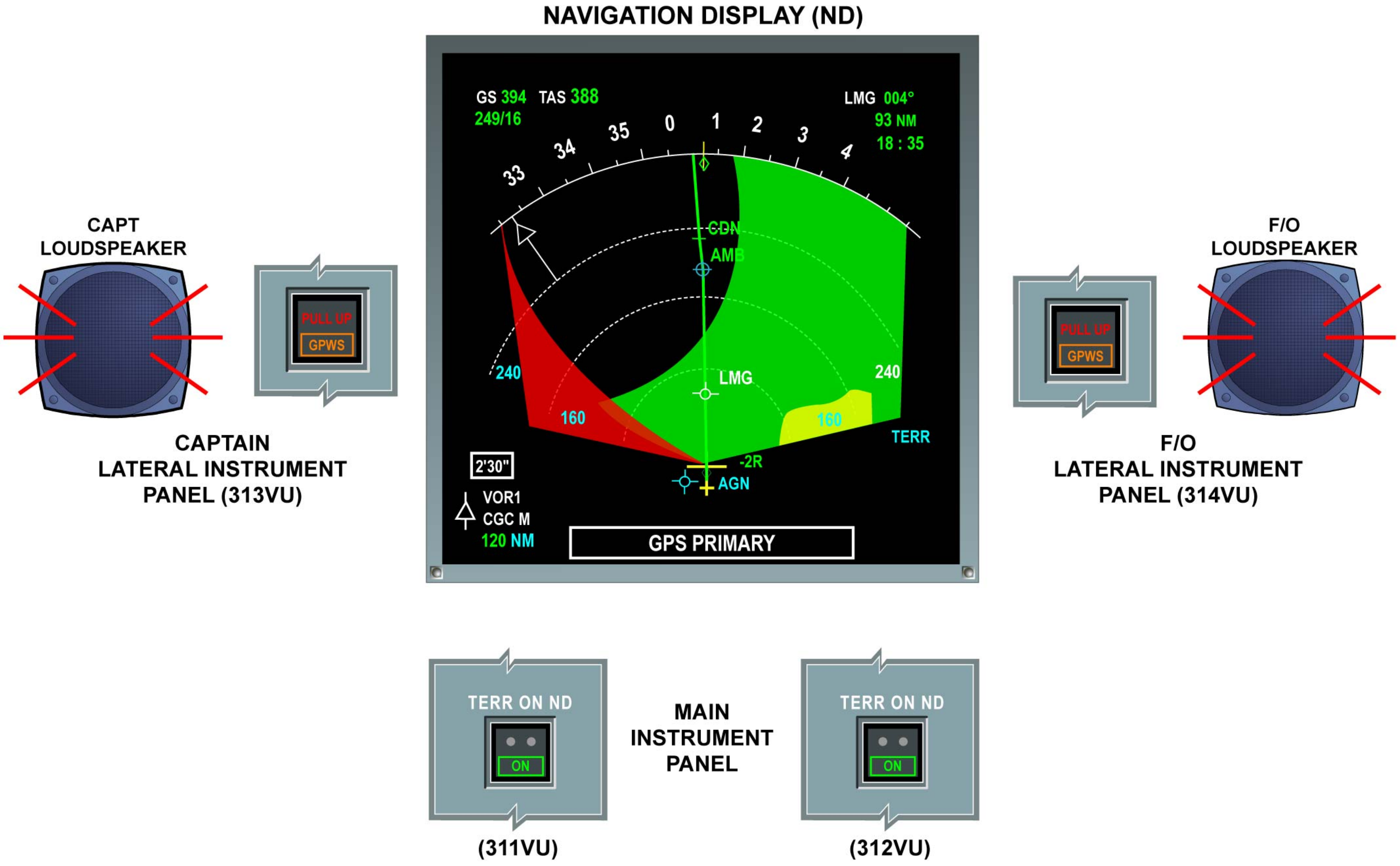
CONTROL AND INDICATING

Different P/Bs let the crew control the actions of the EGPWS. When pressed in, on the GPWS panel, the SYStem P/B inhibits all the GPWS warnings, the G/S MODE P/B inhibits the G/S mode and the FLAP MODE P/B inhibits flap abnormal condition input and generates the "GPWS FLAP MODE OFF" ECAM message. When pressed in, the TERRain P/B in white legend inhibits the terrain awareness. When pressed in, on the main instrument panel, the CAPT or F/O GPWS G/S P/B cancels the G/S announcement or initiates the test sequence. When the TERR ON ND P/B is pressed in, on the center instrument panel, the green ON legend comes on to indicate that terrain data is displayed on the ND. The enhanced functions are GPWS added functions, which automatically display, on the NDs, the terrain data, in place of the radar image, when a terrain caution or warning is detected or at any time by using the TERR ON ND P/B. If the optional PWS is activated, the PWS alerts have priority over EGPWS modes. The digital and discrete data inputs are used in different combinations to monitor A/C vertical path. If the warning envelope is penetrated, visual and aural warnings are generated. The aural messages are broadcasted, and the EGPWS lights indicate visual warnings.



EGPWS - CONTROL AND INDICATING

G6B08031 - G10T4T0 - FM34PB000000001



EGPWS - CONTROL AND INDICATING

G6B08031 - G10T4T0 - FM34PB000000001

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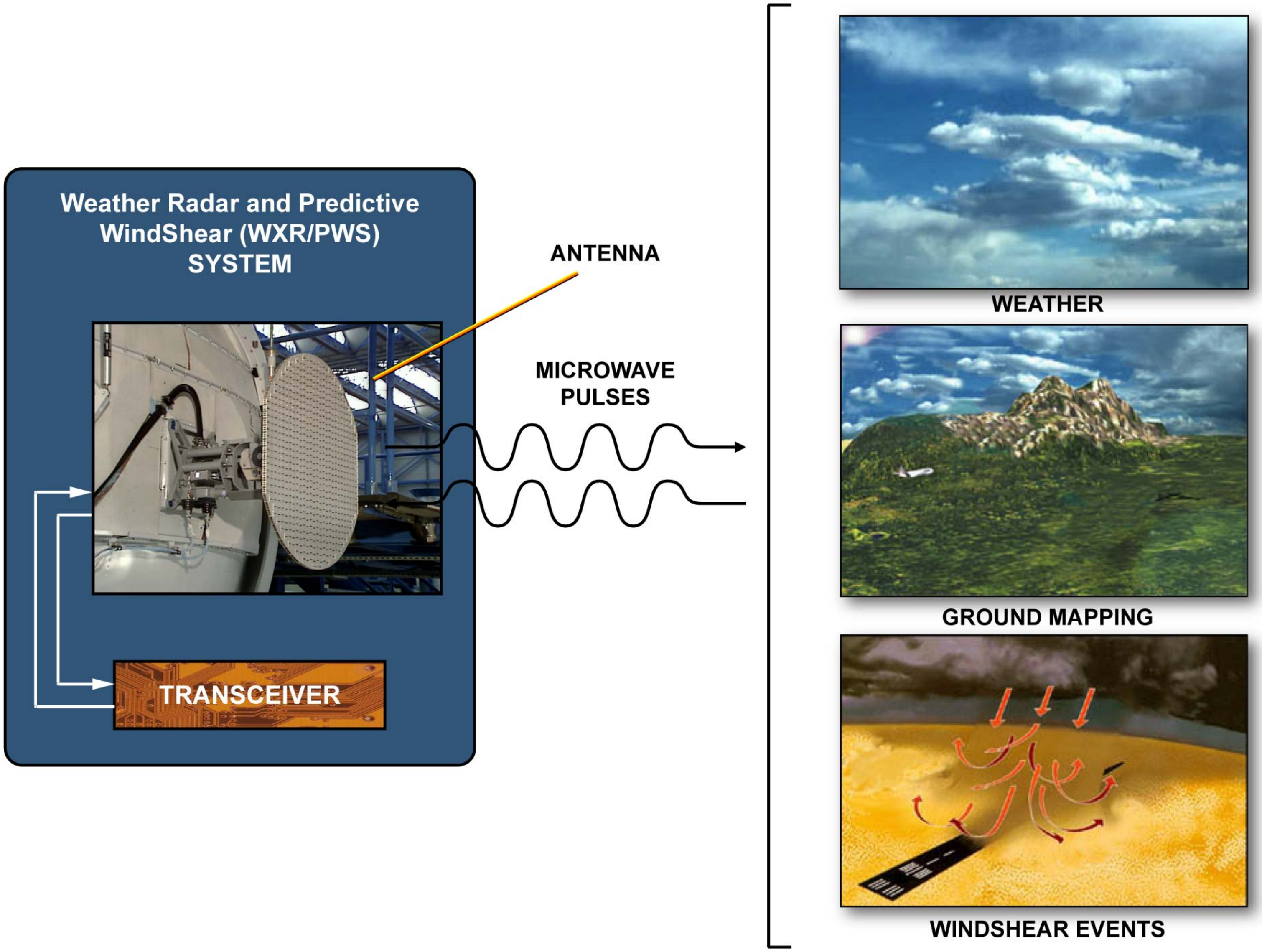
34 NAVIGATION SYSTEM PRESENTATION (1)

WEATHER RADAR

PRINCIPLE

The airborne WXR and PWS is used for the detection and display of severe weather areas, gives a ground mapping and also detects windshear events. The WXR/PWS helps the pilot to avoid these areas and the related turbulence. The transceiver emits microwave pulses through a directional antenna that picks up the return signals. The range is determined by the time taken for the echo to return. The azimuth is given by the antenna position when the echo is received.

NOTE: Optionally, the aircraft may be equipped with a multiscan radar transceiver. The multiscan function reduces pilot workload and optimizes weather detection.



WEATHER RADAR - PRINCIPLE

34 NAVIGATION SYSTEM PRESENTATION (1)

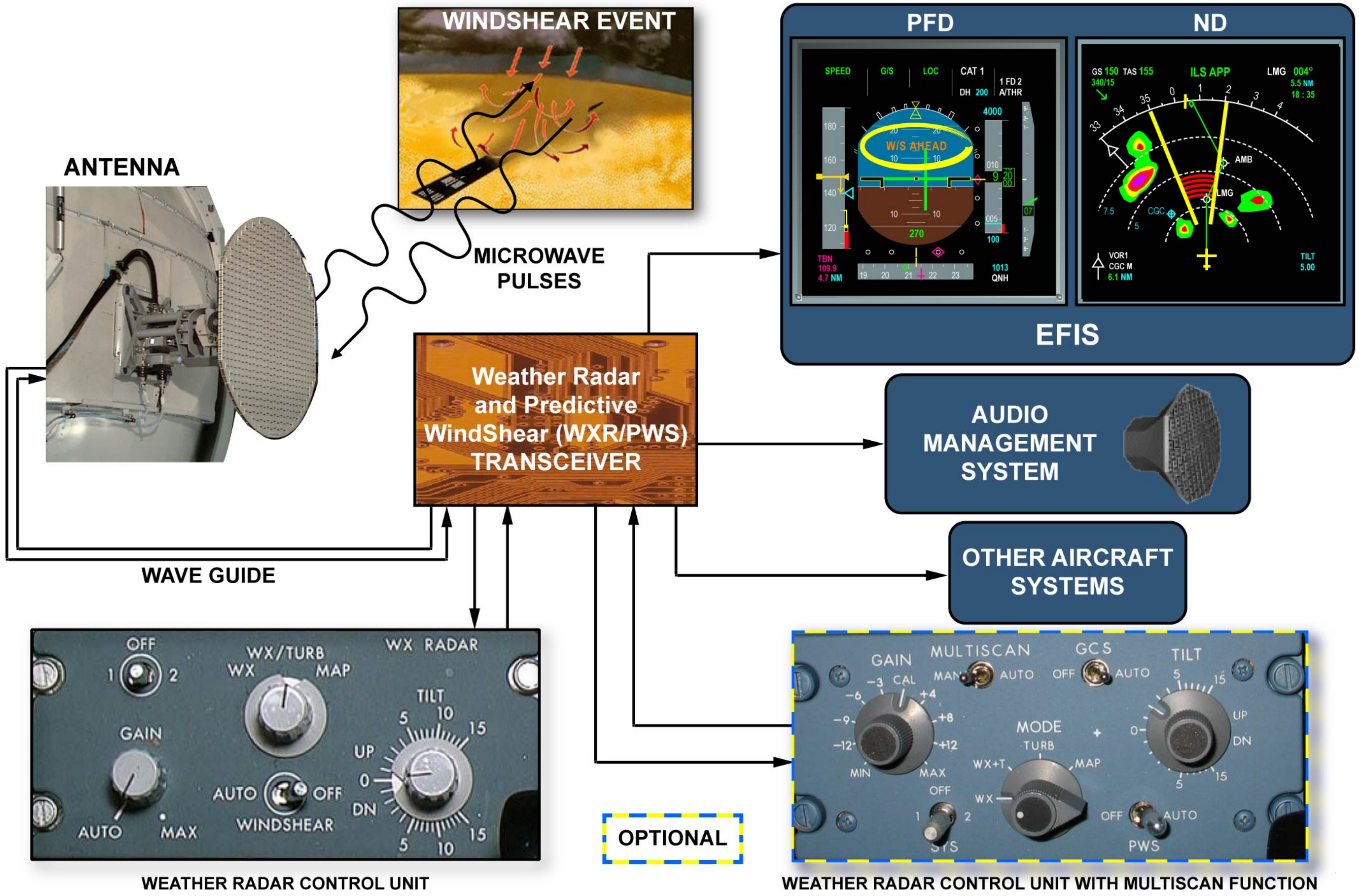
WEATHER RADAR (continued)

CONTROL AND INDICATING

The WXR/PWS transceiver generates the microwave pulses. A wave-guide is used as a Radio Frequency (RF) connection between the transceiver and the antenna. The antenna is used for transmitting and receiving the RF signals. The return signal is processed and formatted by the transceiver for display on the ND. When a windshear event is detected, the information is displayed to the crew on both EFIS displays. An aural warning is also generated. The WXR/PWS transceiver also interfaces with other aircraft systems. A weather radar control unit enables the crew to control the mode of operation of the WXR/PWS. It also enables them to adjust several parameters (e.g. antenna tilt or gain control).

NOTE: Optionally, the weather radar control unit with the multiscan mode is installed.

G6B08031 - G10T4T0 - FM34PB000000001



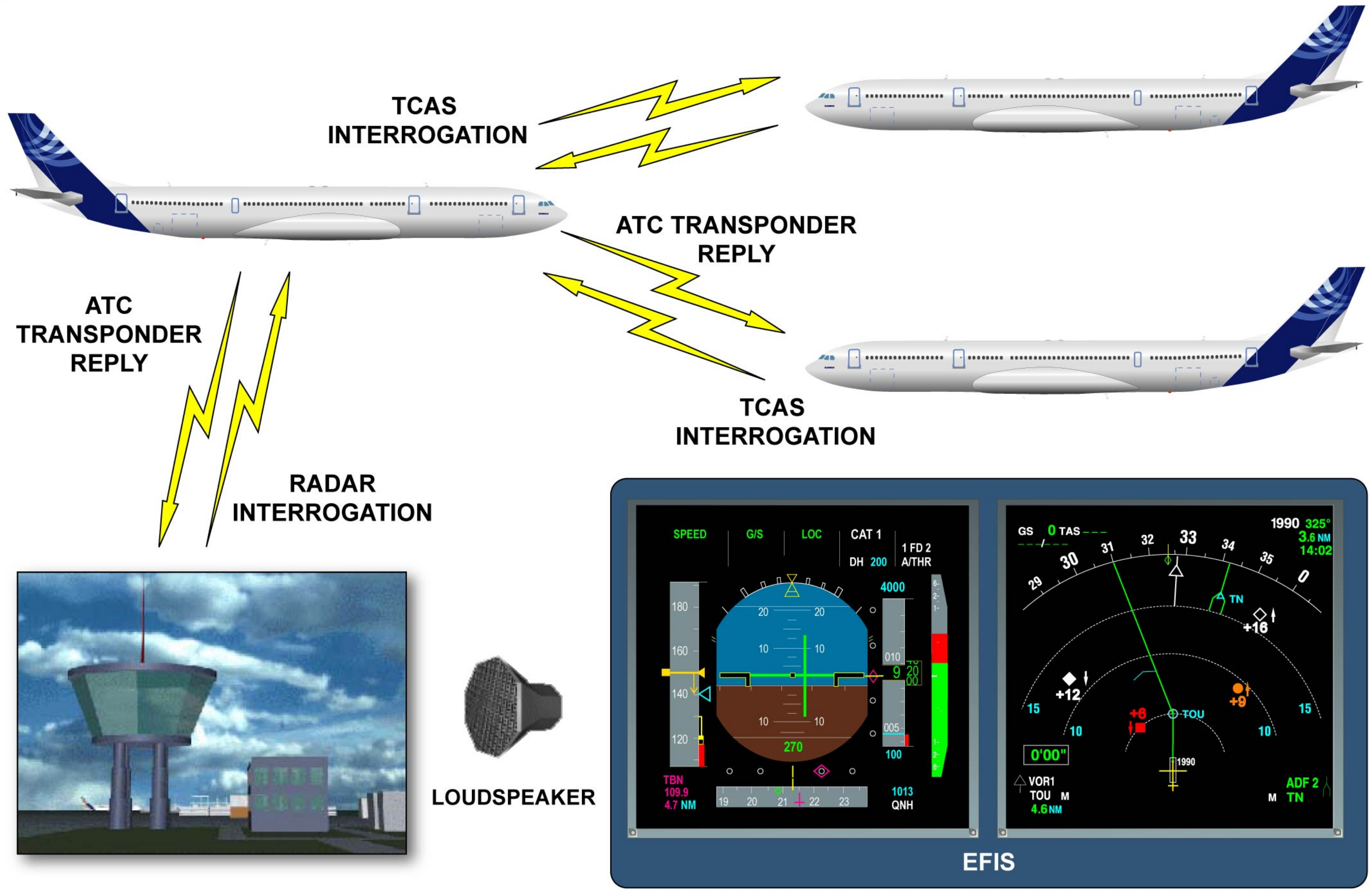
WEATHER RADAR - CONTROL AND INDICATING

34 NAVIGATION SYSTEM PRESENTATION (1)

ATC/TCAS

GENERAL

The ATC system replies to ground station interrogations to enable the controller to identify and locate the aircraft. It also replies to TCAS interrogations. The TCAS interrogates ATC-equipped aircraft in its vicinity. The TCAS provides aural and visual advisories to the crew in case an intruder is detected or the aircraft is in a hazardous traffic configuration.



ATC/TCAS - GENERAL

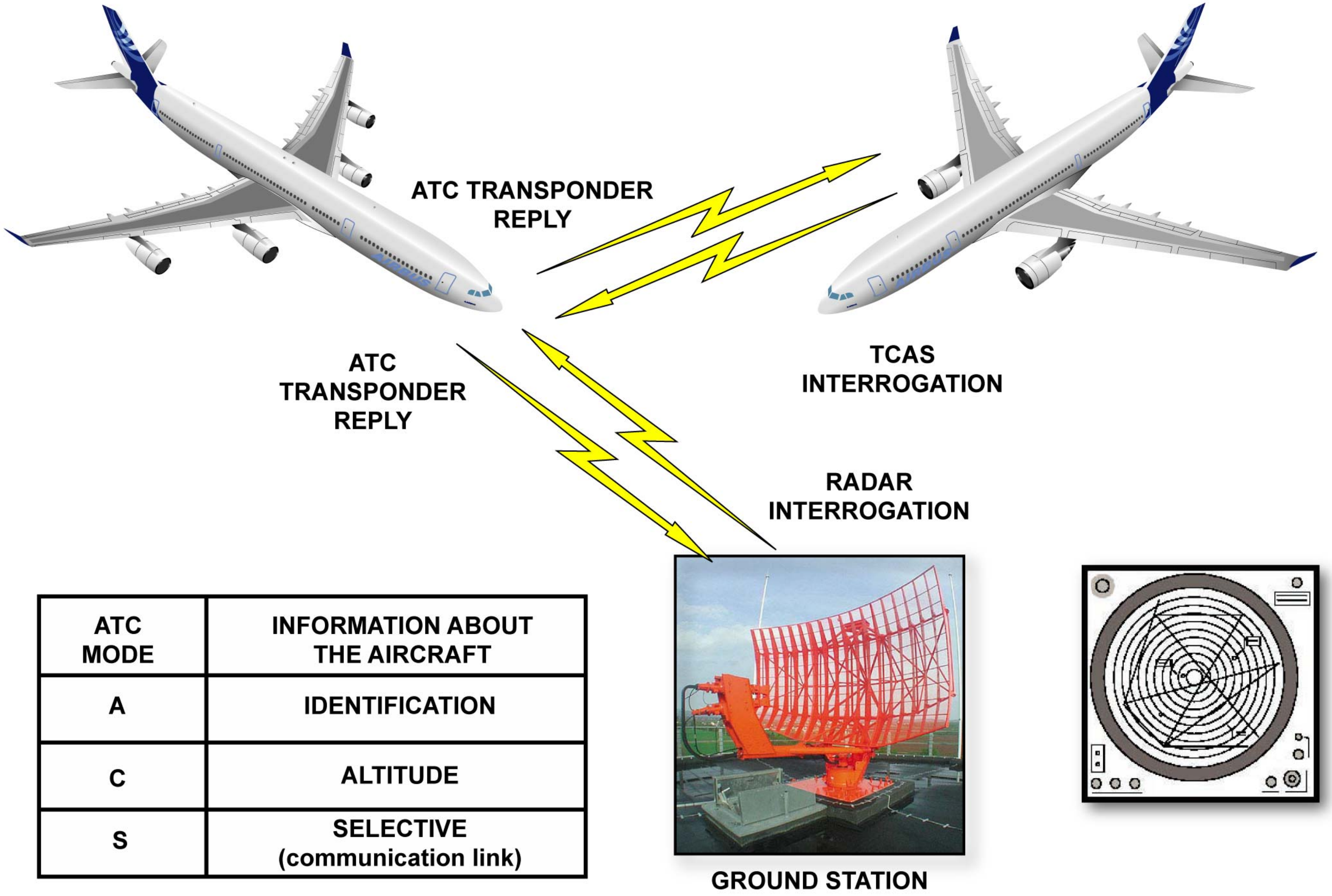
G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

ATC/TCAS (continued)

ATC PRINCIPLE

The ATC transponder is an integral part of the Air Traffic Control Radar Beacon (ATCRB) system. The ATC transponder is interrogated by radar pulses received from the ground station. It automatically replies back to the ground station with a series of pulses. Depending on the type of transponder installed on the aircraft, the system supplies air traffic controllers with: Aircraft identification for a mode A transponder, aircraft barometric altitude for a mode C transponder, and a unique aircraft address and flight data for a mode S transponder. The discrete addressing and digital encoding of mode S transmissions allows their use as a digital data link. The ATC transponder also replies to interrogations from other aircraft with a TCAS.



ATC MODE	INFORMATION ABOUT THE AIRCRAFT
A	IDENTIFICATION
C	ALTITUDE
S	SELECTIVE (communication link)

ATC/TCAS - ATC PRINCIPLE

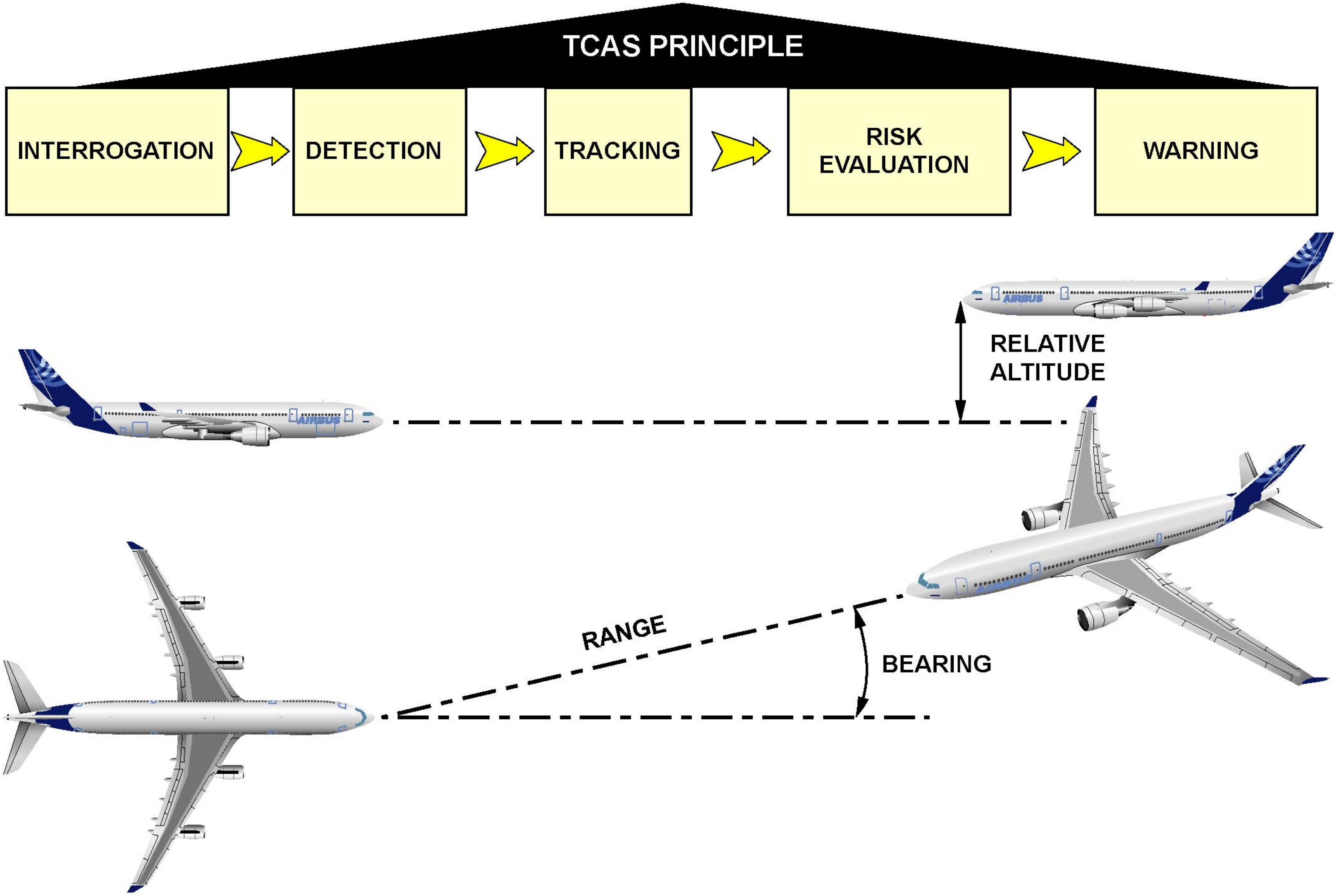
G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

ATC/TCAS (continued)

TCAS PRINCIPLE

The function of the TCAS is to interrogate, detect and track the trajectory of intruder A/C in order to evaluate the risk of collision. Consequently, the TCAS gives advisories to the flight crew to fulfill vertical separation. The TCAS needs to acquire the following intruder parameters in order to give advisories: the relative altitude and the range.



ATC/TCAS - TCAS PRINCIPLE

34 NAVIGATION SYSTEM PRESENTATION (1)

ATC/TCAS (continued)

ATC/TCAS CONTROL

The control panel on the center pedestal helps the pilot to control the ATC and TCAS systems.

G6B08031 - G10T4T0 - FM34PB000000001

View of the A330,
the location is identical for the A340.

CONTROL UNIT

ATC/TCAS - ATC/TCAS CONTROL

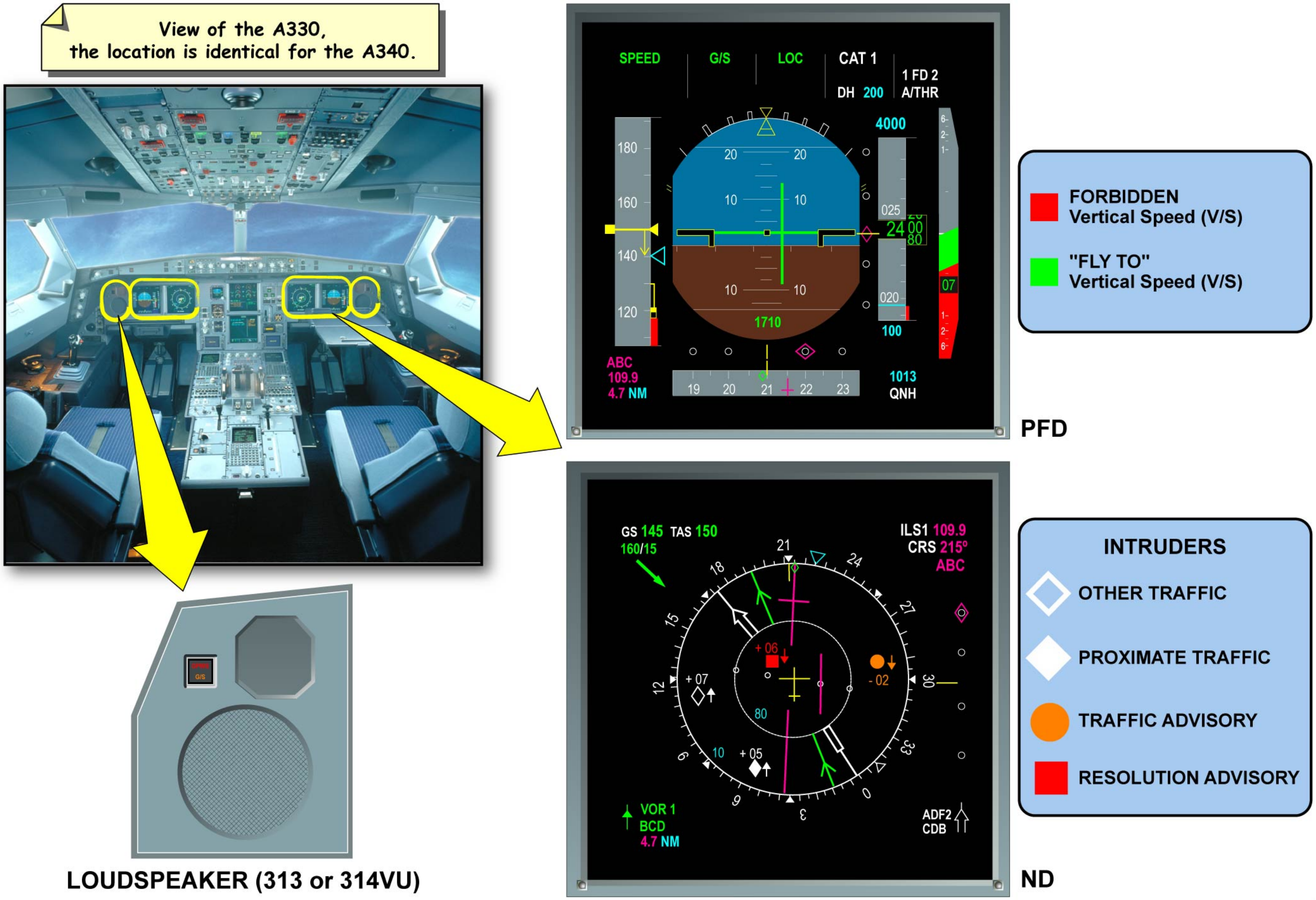
G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

ATC/TCAS (continued)

TCAS INDICATING

The TCAS information is displayed on CAPT and F/O EFIS. In case of imminent risk of conflict, TCAS audio messages are broadcasted through the cockpit loudspeakers.



ATC/TCAS - TCAS INDICATING

G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

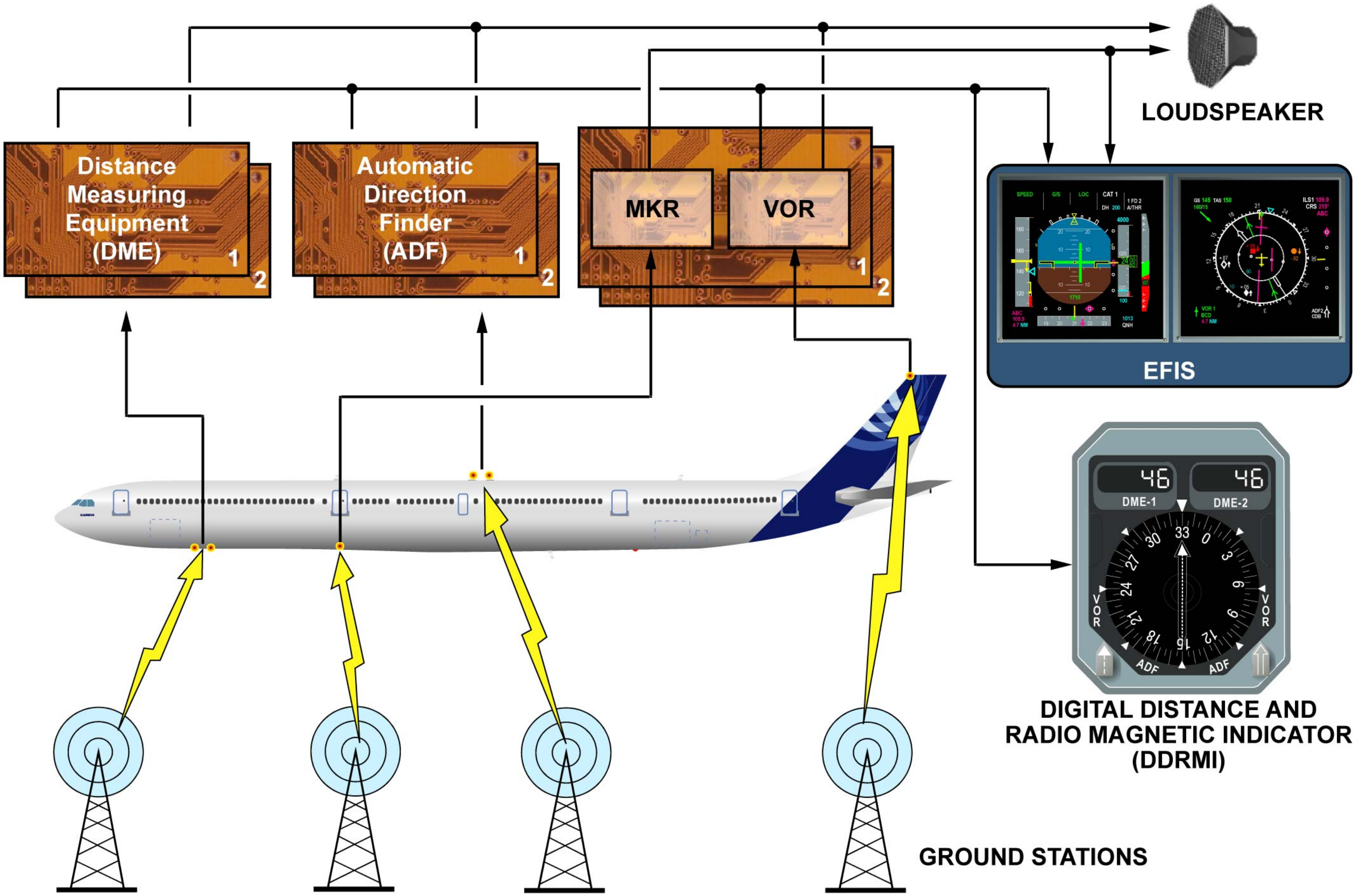
VOR/MKR/DME/ADF

PRINCIPLE

The VOR system is a navigation aid that receives, decodes and processes signals received from the omnidirectional ground station, for the bearing information. The MKR system is a radio navigation aid, which gives indicators related to the distance between the aircraft and the runway threshold. When the aircraft over flies one of the MKR transmitters, the system gives aural and visual indications to the flight crew.

NOTE: The MKR and VOR features are included in the same computer.

The MKR function is only active in VOR/MKR 1. The DME system is a radio navigation aid that computes the slant distance between the aircraft and a DME ground station. ADF computes the bearing of ADF GND station. The ADF system is a radio navigation aid that computes the bearing of an ADF ground station in respect of the aircraft heading. Data are displayed to the crew.



VOR/MKR/DME/ADF - PRINCIPLE

G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

VOR/MKR/DME/ADF (continued)

CONTROL AND INDICATING

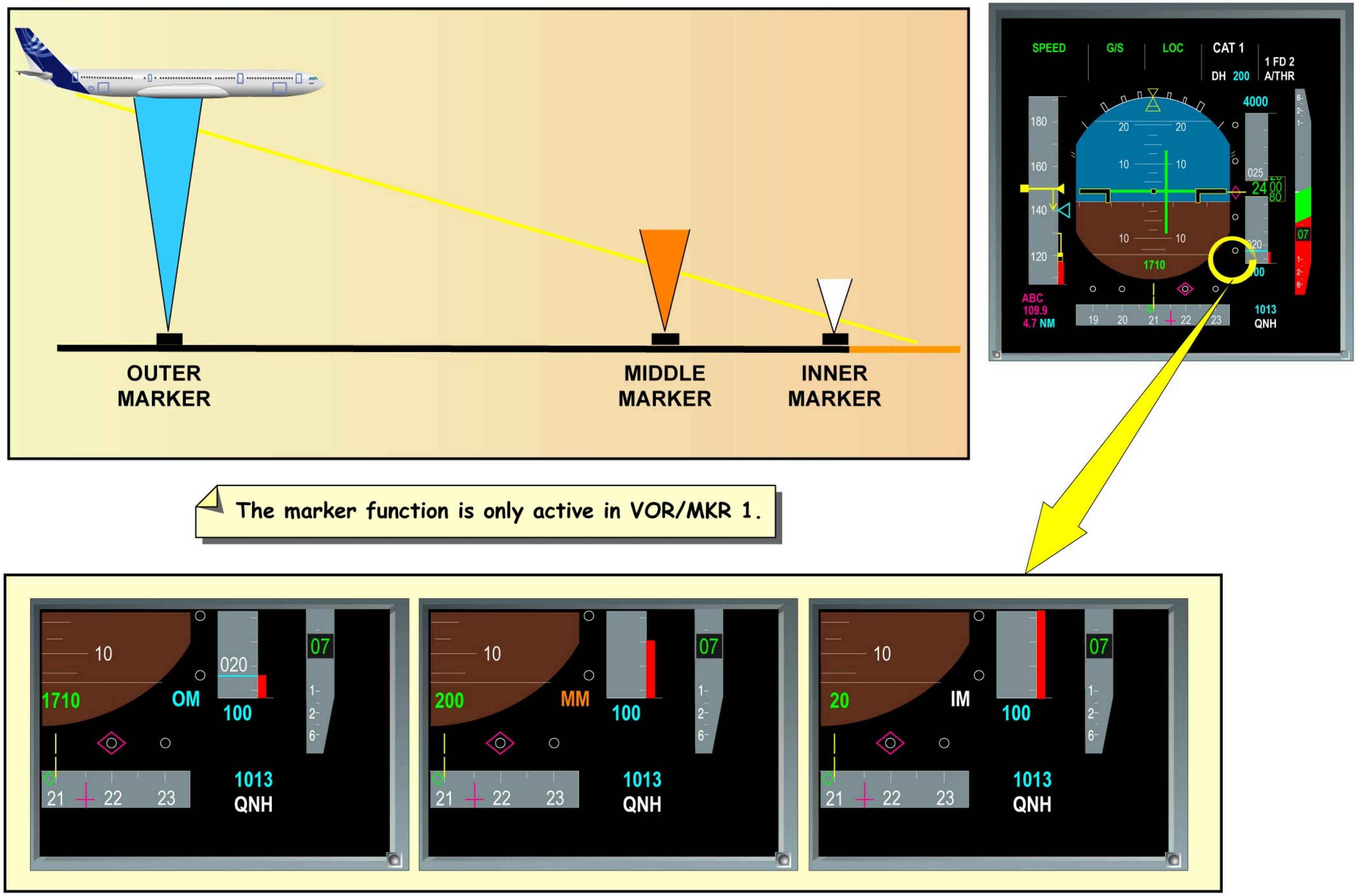
VOR/DME/ADF data are displayed on the ND according to the EFIS control panels selection.
MKR information is displayed on CAPT and F/O PFDs.

G6B08031 - G10T4T0 - FM34PB000000001

CAPT EFIS CONTROL PANEL

ND

VOR/MKR/DME/ADF - CONTROL AND INDICATING



VOR/MKR/DME/ADF - CONTROL AND INDICATING

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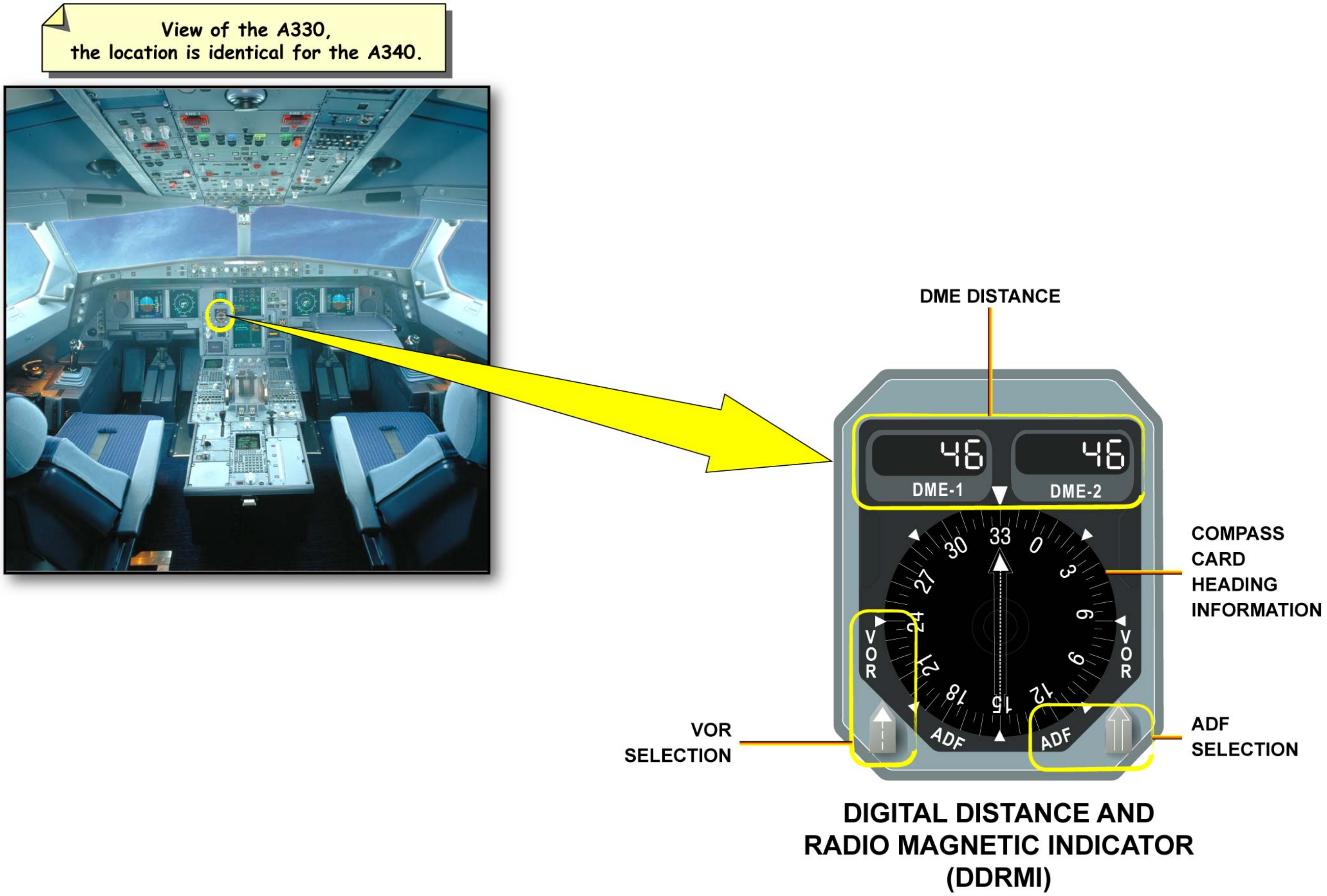
34 NAVIGATION SYSTEM PRESENTATION (1)

DDRMI

The DDRMI is mounted on the forward instrument panel. This instrument gives to the crew the following information:
- DME distance,
- VOR bearing,
- ADF bearing,
- heading information.



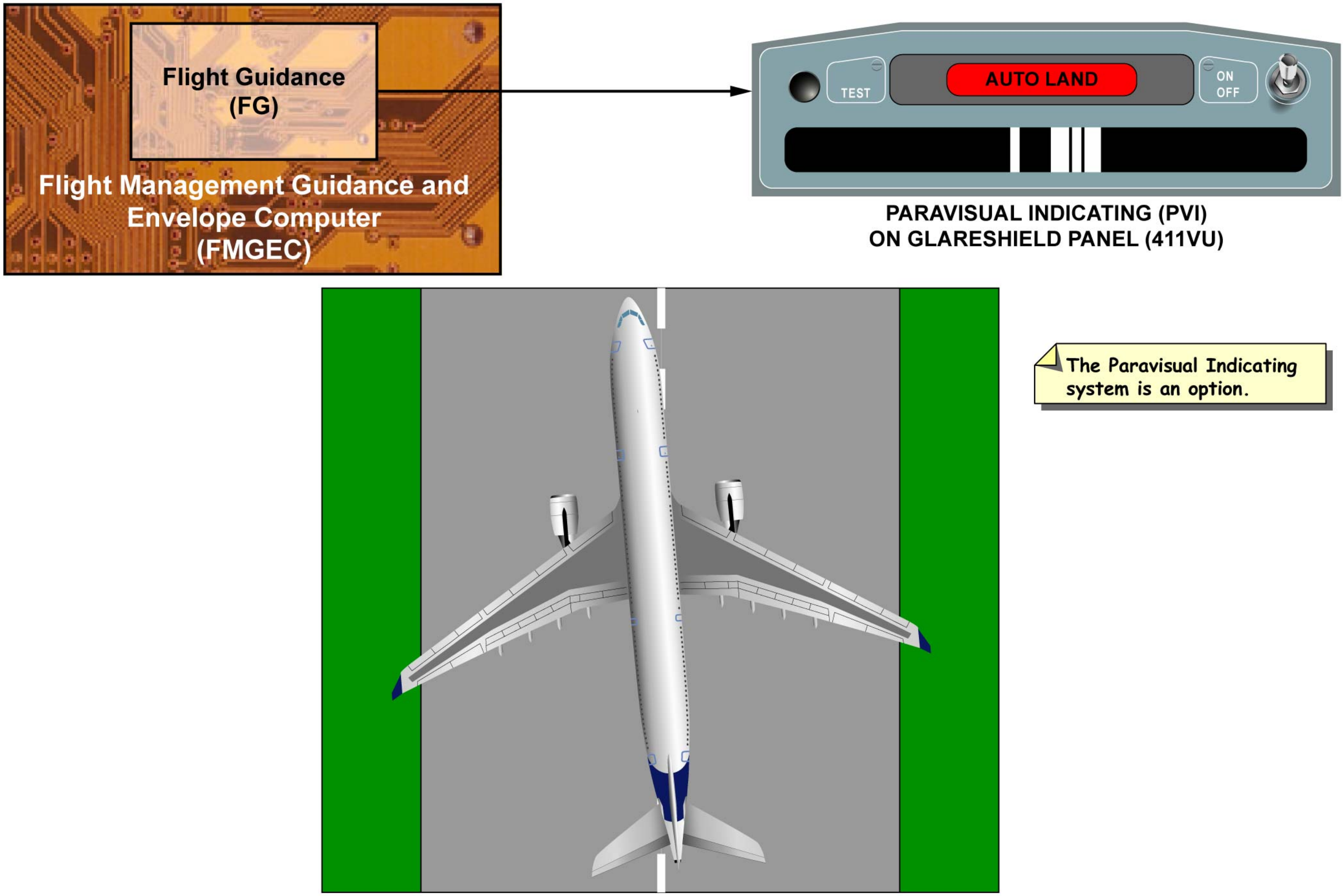
DDRMI

G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

PARAVISUAL INDICATING SYSTEM (OPTION)

The PVI is a roll-out piloting aid system when on runway, during roll-out and landing. The PVI displays guidance indications to the pilot to keep the aircraft on the center line.



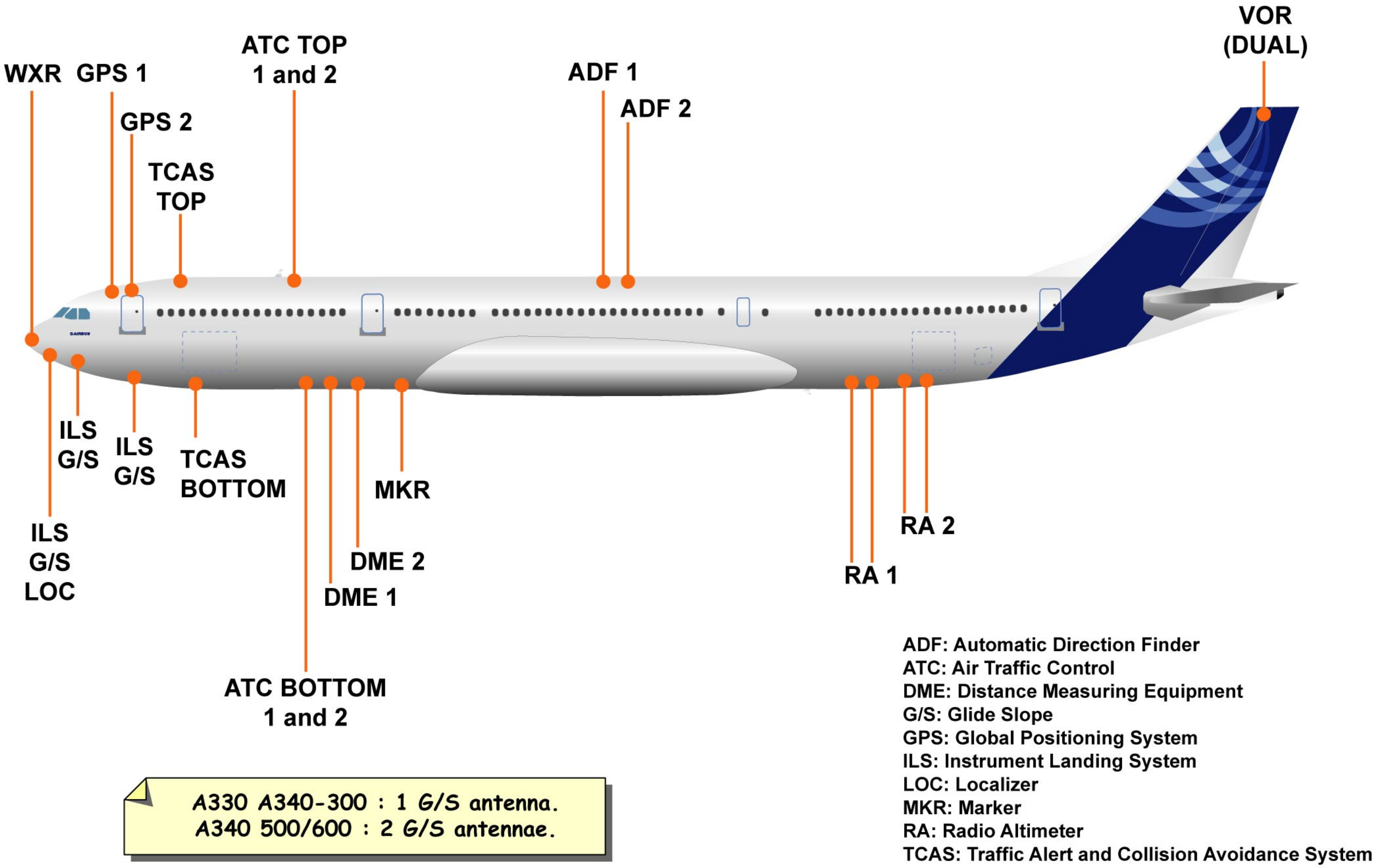
PARAVISUAL INDICATING SYSTEM (OPTION)

34 NAVIGATION SYSTEM PRESENTATION (1)

RADIO NAVIGATION COMPONENT

GENERAL

This diagram shows the location of the various radio-navigation antennae.



ADF: Automatic Direction Finder
ATC: Air Traffic Control
DME: Distance Measuring Equipment
G/S: Glide Slope
GPS: Global Positioning System
ILS: Instrument Landing System
LOC: Localizer
MKR: Marker
RA: Radio Altimeter
TCAS: Traffic Alert and Collision Avoidance System
VOR: VHF Omnidirectional Range
WXR: Weather Radar

RADIO NAVIGATION COMPONENT - GENERAL

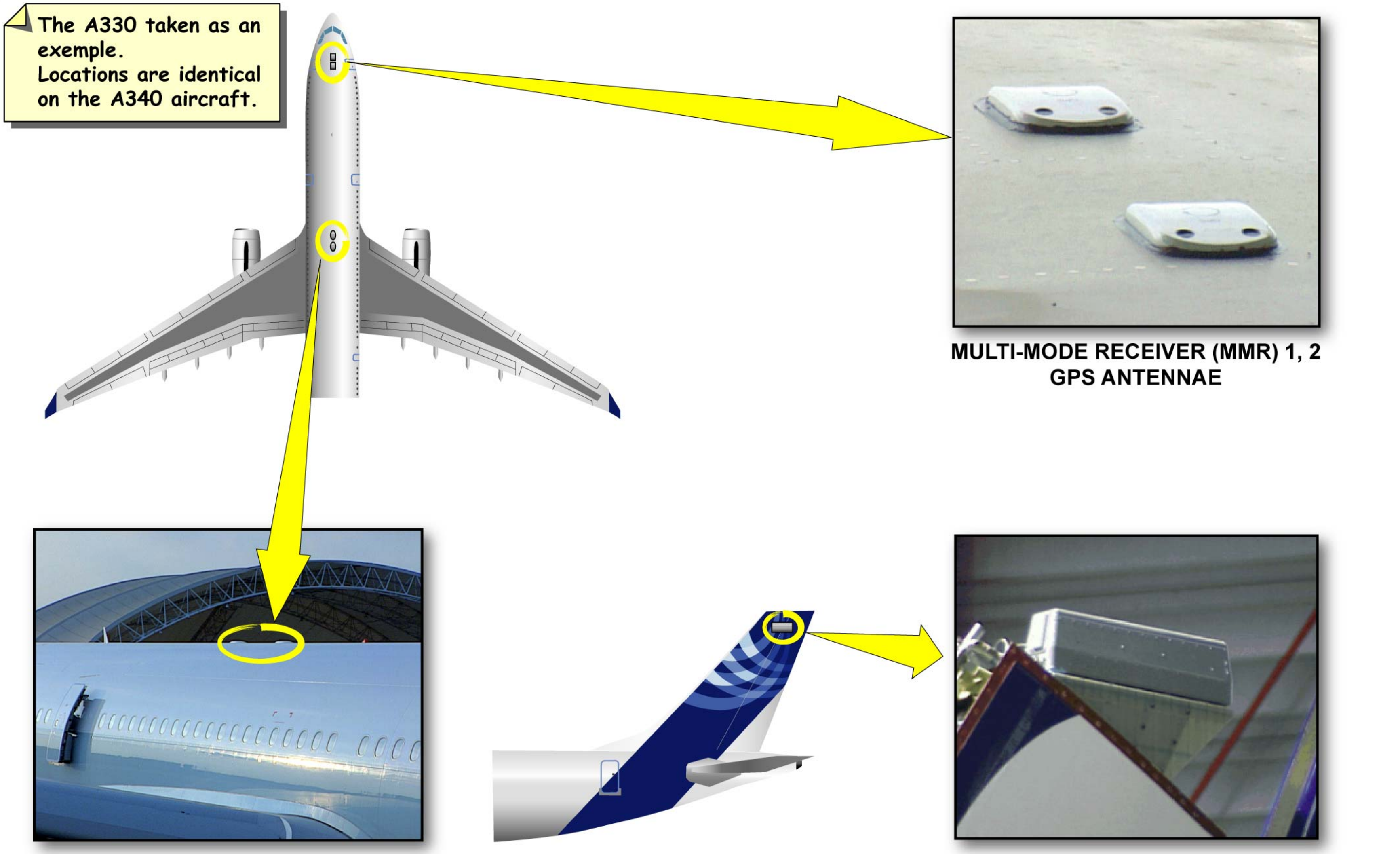
G6B08031 - G10T4T0 - FM34PB000000001

34 NAVIGATION SYSTEM PRESENTATION (1)

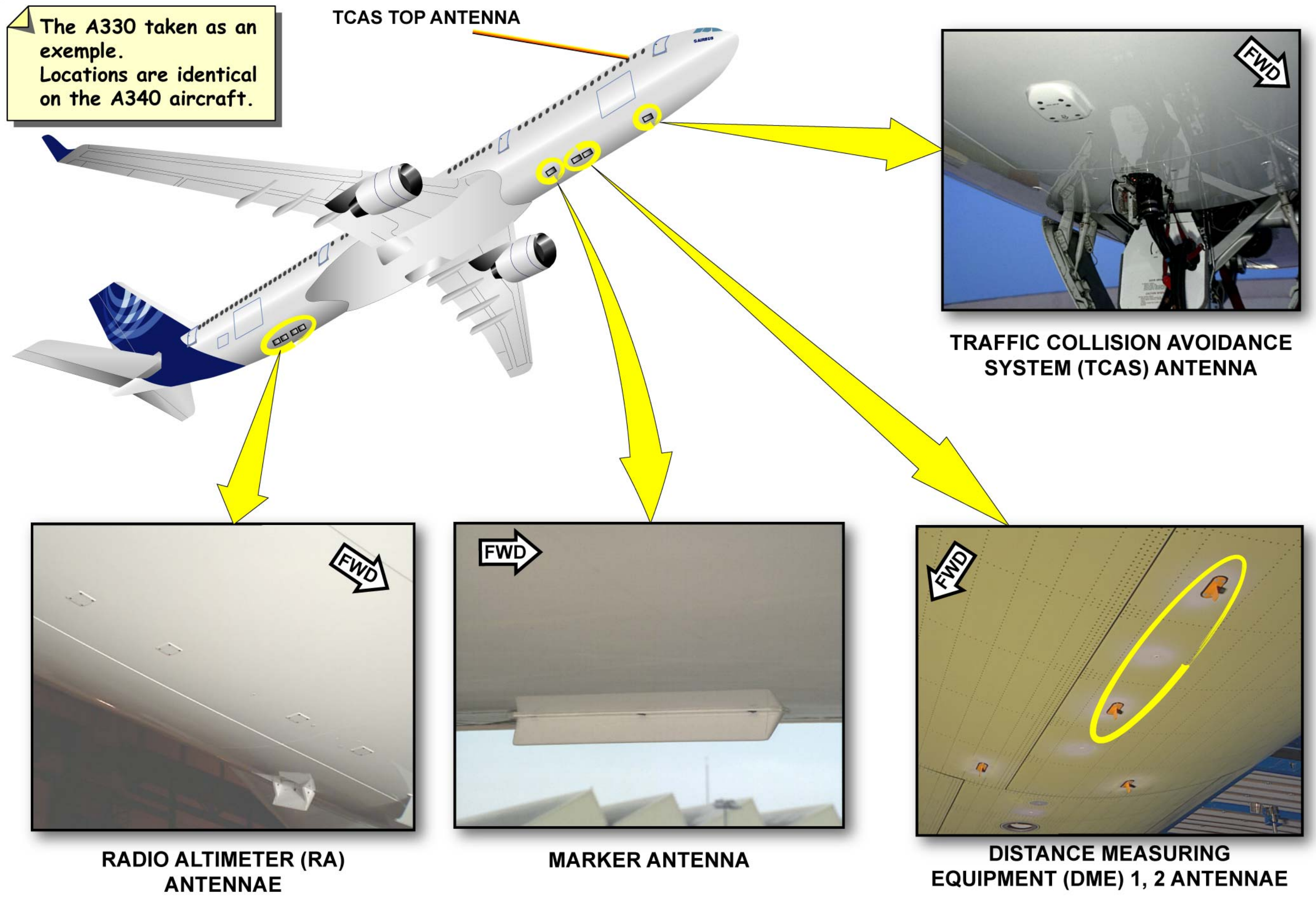
RADIO NAVIGATION COMPONENT (continued)

NAVIGATION ANTENNAE LOCATION

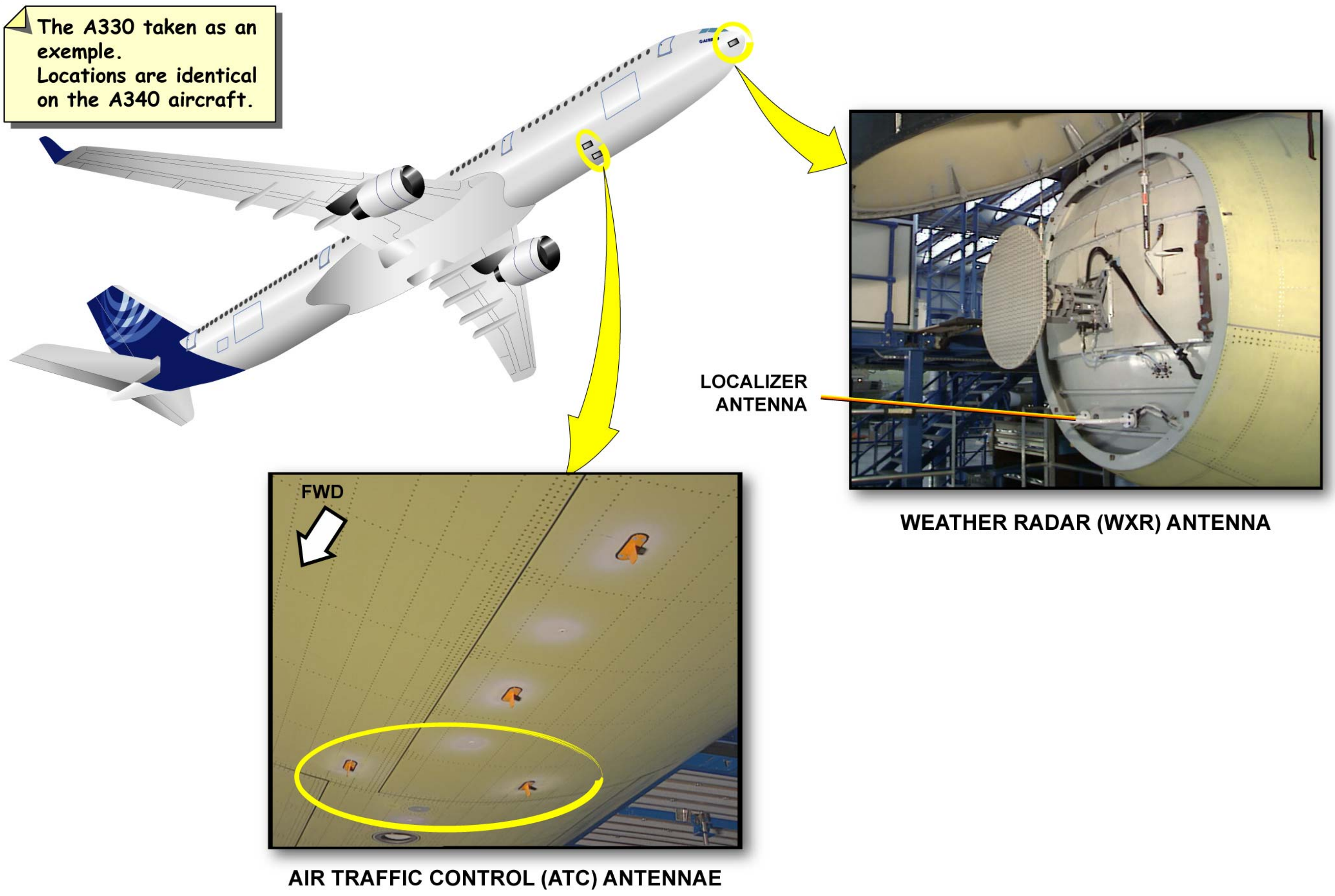
The MMR (GPS), ADF and VOR antennae are installed on the upper part of the fuselage.
The MKR antenna and DME antennae are installed on the lower portion of the fuselage. There are also two TCAS antennae (1 at the top, and 1 at the bottom) and four RA antennae located on the lower portion of the fuselage.
The four ATC antennae are located on the upper and lower portion of the fuselage. The LOC dual antenna is located in the radome.
The A330 and A340-300 G/S installation has one G/S antenna. The A340-500/600 G/S installation has two G/S antennae; one capture antenna located in the radome and one track antenna located on the NLG.



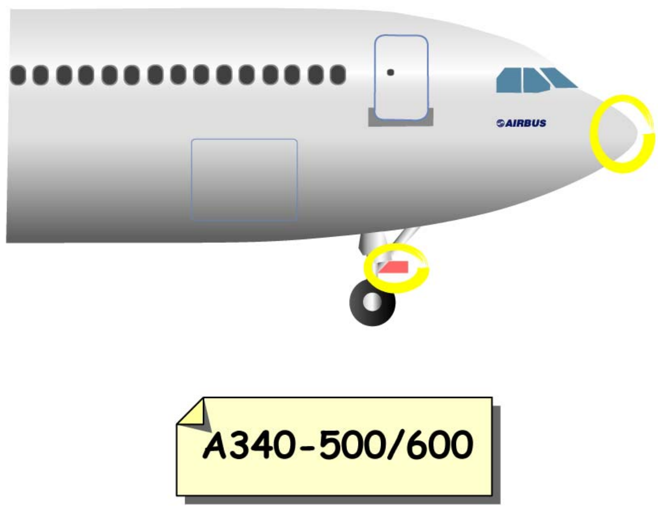
RADIO NAVIGATION COMPONENT - NAVIGATION ANTENNAE LOCATION



RADIO NAVIGATION COMPONENT - NAVIGATION ANTENNAE LOCATION

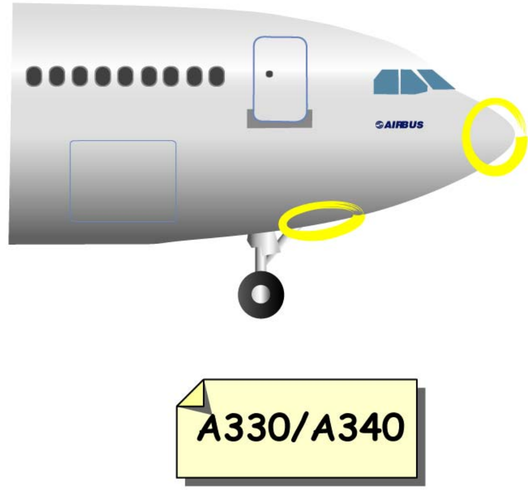


RADIO NAVIGATION COMPONENT - NAVIGATION ANTENNAE LOCATION



LOCALIZER AND GLIDE/SLOPE ANTENNAE

GLIDE/SLOPE ANTENNA (ON NOSE LANDING GEAR)



LOCALIZER ANTENNA

GLIDE/SLOPE ANTENNA ACCESS PANEL

RADIO NAVIGATION COMPONENT - NAVIGATION ANTENNAE LOCATION

G6B08031 - G10T4T0 - FM34PB0000000001

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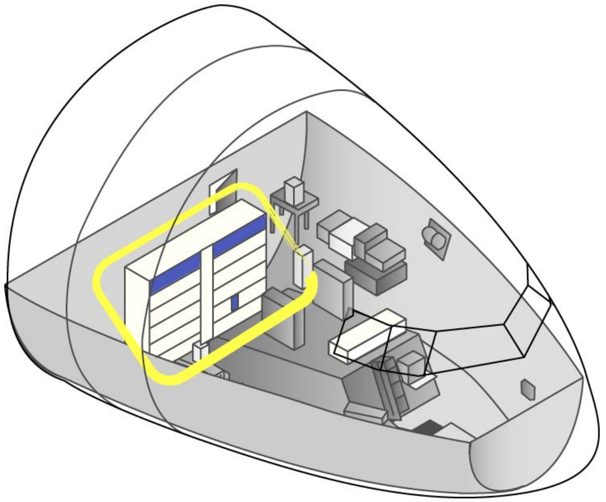
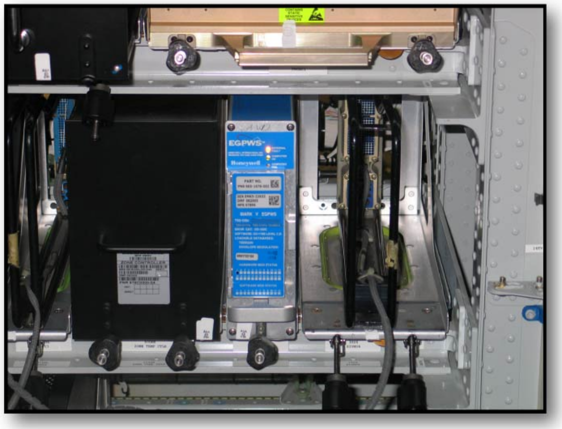
34 NAVIGATION SYSTEM PRESENTATION (1)

RADIO NAVIGATION COMPONENT (continued)

NAVIGATION COMPUTER LOCATION

The Enhanced Ground Proximity Warning Computer (EGPWC), the VOR 1 and 2 receivers, the ATC transponder and the TCAS computer are located in the main avionics rack. Optionally, a Terrain and Traffic Collision Avoidance System (T2CAS) can be installed as a combination of two functions in a single LRU. These functions are the TCAS (TCAS II Change 7) and the Terrain Awareness and Warning System (TAWS).
The DME 1 and 2 interrogators, the ADF 1 and 2 receivers are also located in the main avionics rack. The two MMRs and the WXR transceivers are located in the forward part of the avionics compartment.
The RA transceiver 1 and 2 are located in the side panel of the aft cargo compartment.





ENHANCED GROUND PROXIMITY WARNING COMPUTER (EGPWC)

VHF OMNIDIRECTIONEL RANGE (VOR)

TRAFFIC AND TERRAIN COLLISION AVOIDANCE SYSTEM (T2CAS)

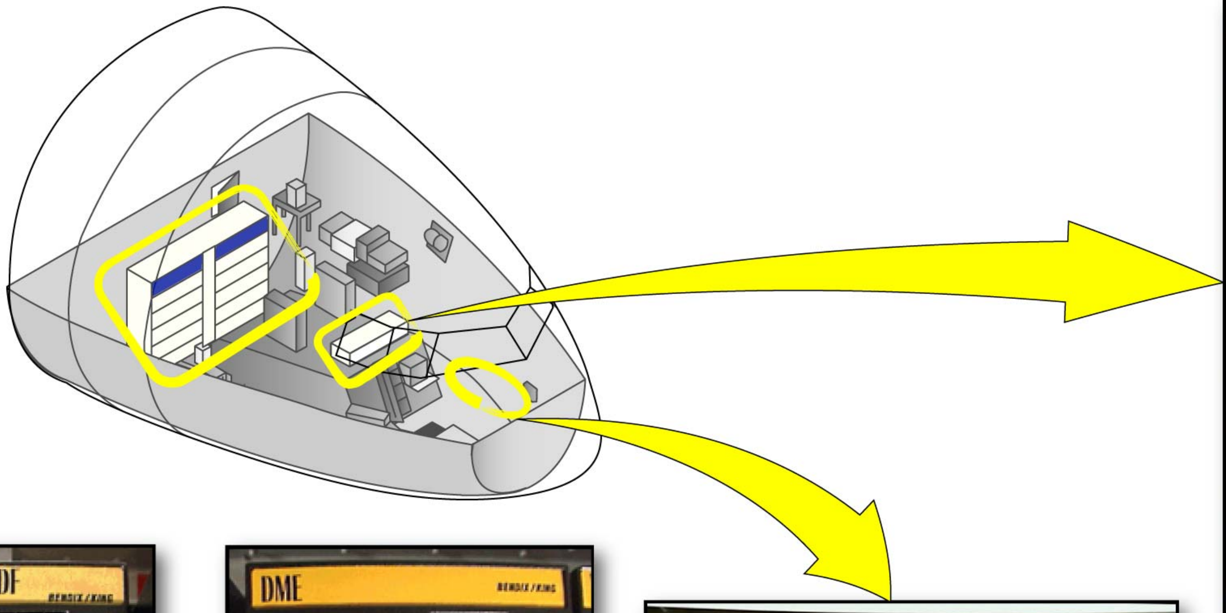
Optional
T2CAS = TCAS + EGPWS

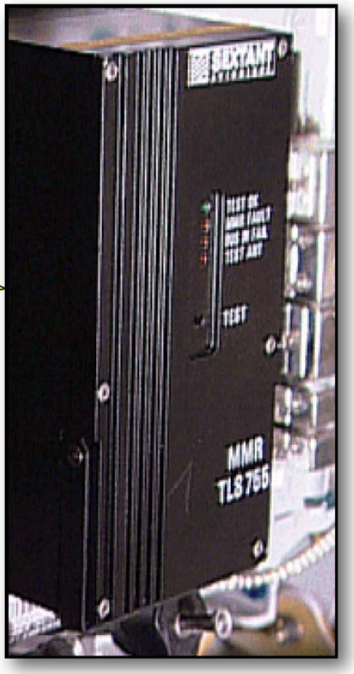
TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS)

AIR TRAFFIC CONTROL (ATC)

RADIO NAVIGATION COMPONENT - NAVIGATION COMPUTER LOCATION

G6B08031 - G10T4T0 - FM34PB000000001





MULTI-MODE RECEIVER (MMR) 1, 2

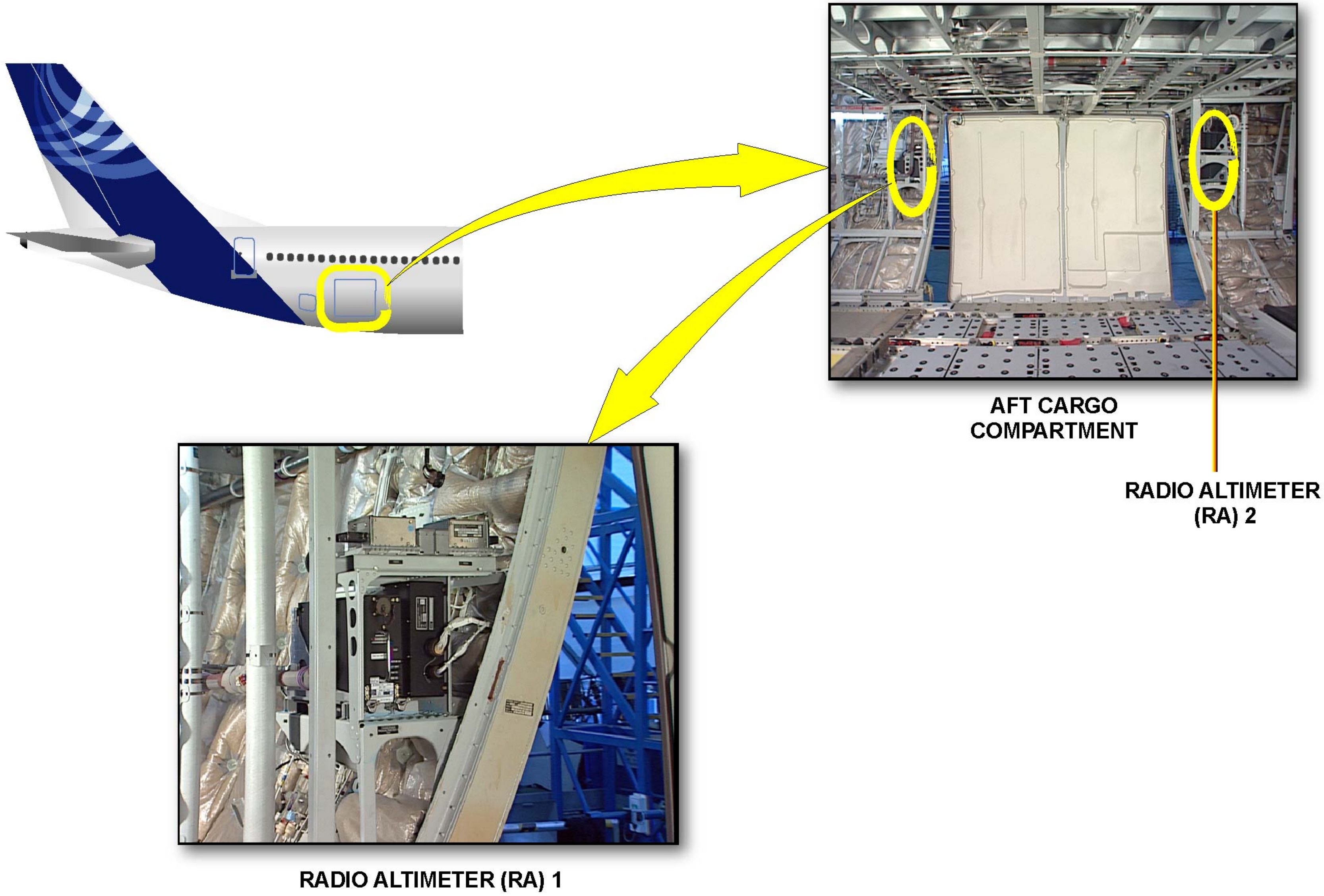
AUTOMATIC DIRECTION FINDER (ADF)

DISTANCE MEASURING EQUIPMENT (DME)

WEATHER RADAR (WXR) 1, 2

RADIO NAVIGATION COMPONENT - NAVIGATION COMPUTER LOCATION

G6B08031 - G10T4T0 - FM34PB000000001



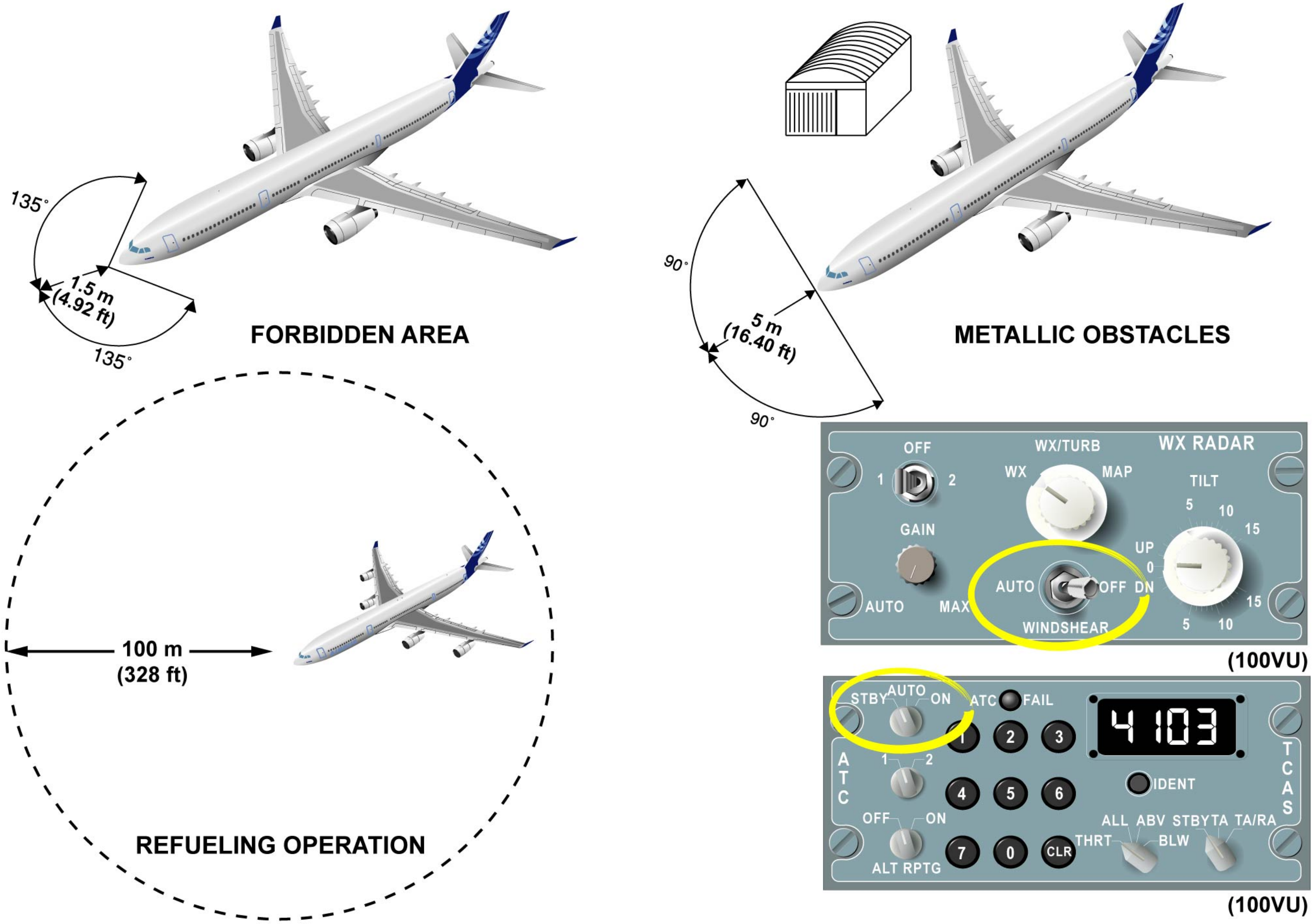
RADIO NAVIGATION COMPONENT - NAVIGATION COMPUTER LOCATION

34 NAVIGATION SYSTEM PRESENTATION (1)

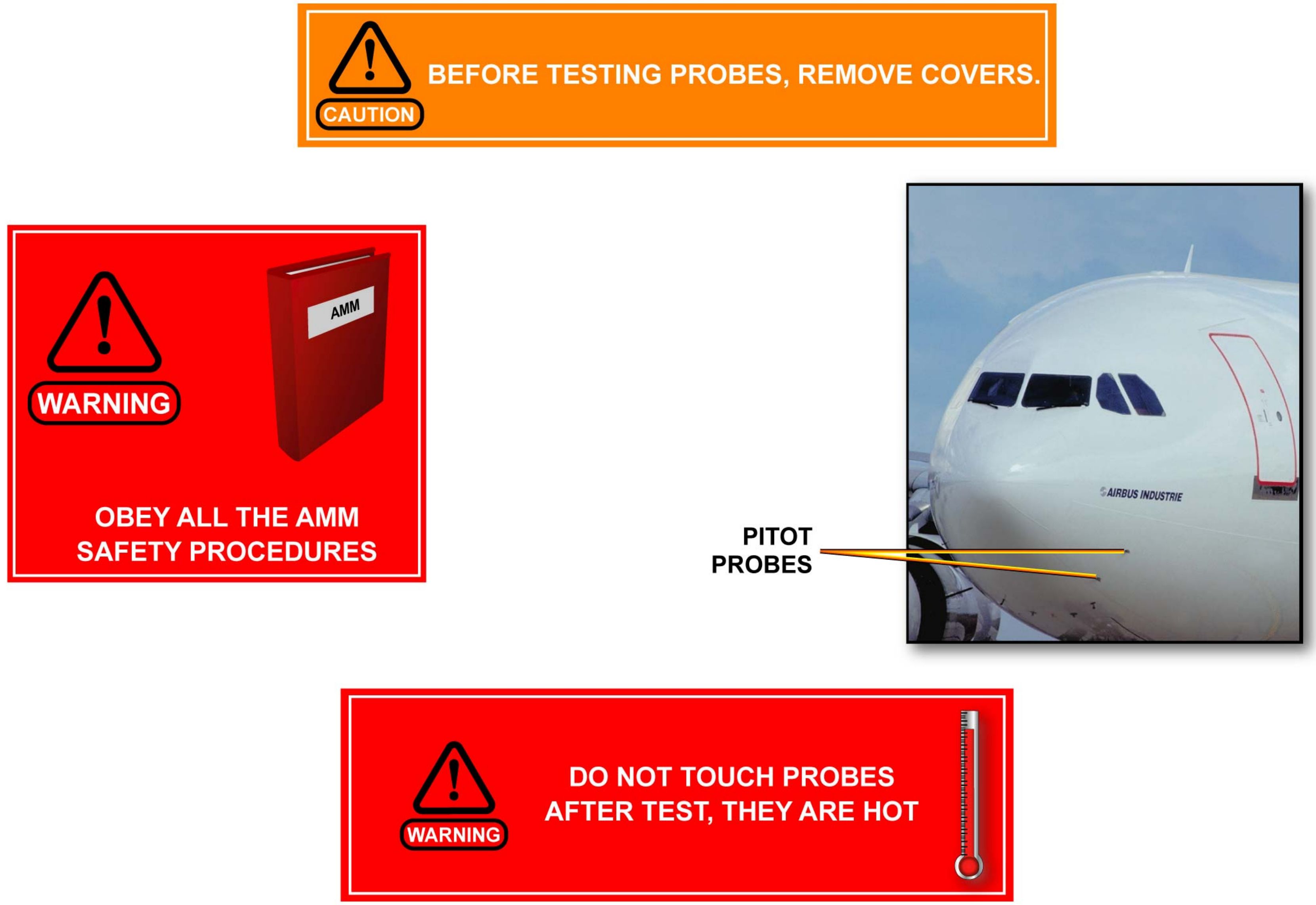
SAFETY PRECAUTION

To prevent the risk of radiation burns, ramp personnel must stand away from transmitting radiation. This area includes a distance of 1.5 meters from the antenna and is within an arc of + or -135 degrees of the nose of the aircraft. The dangerous zone forward of the aircraft must be free of metallic obstacles such as hangars or aircraft within 5 meters in an arc of + or - 90 degrees. The system must not be operated during the refueling of the aircraft or during any refueling operation within 100 meters. In order to prevent automatic activation of the PWS function during maintenance action:
- the PWS switch must be set to OFF and,
- the ATC/TCAS switch must be set to STandBY.

When you work on A/C, make sure that you obey all the AMM procedures. This will prevent injury to persons and/or damage to the A/C. Before you do the test of the probes, remove the protective covers. Do not touch the probes immediately after the test, they are hot.



SAFETY PRECAUTION



SAFETY PRECAUTION

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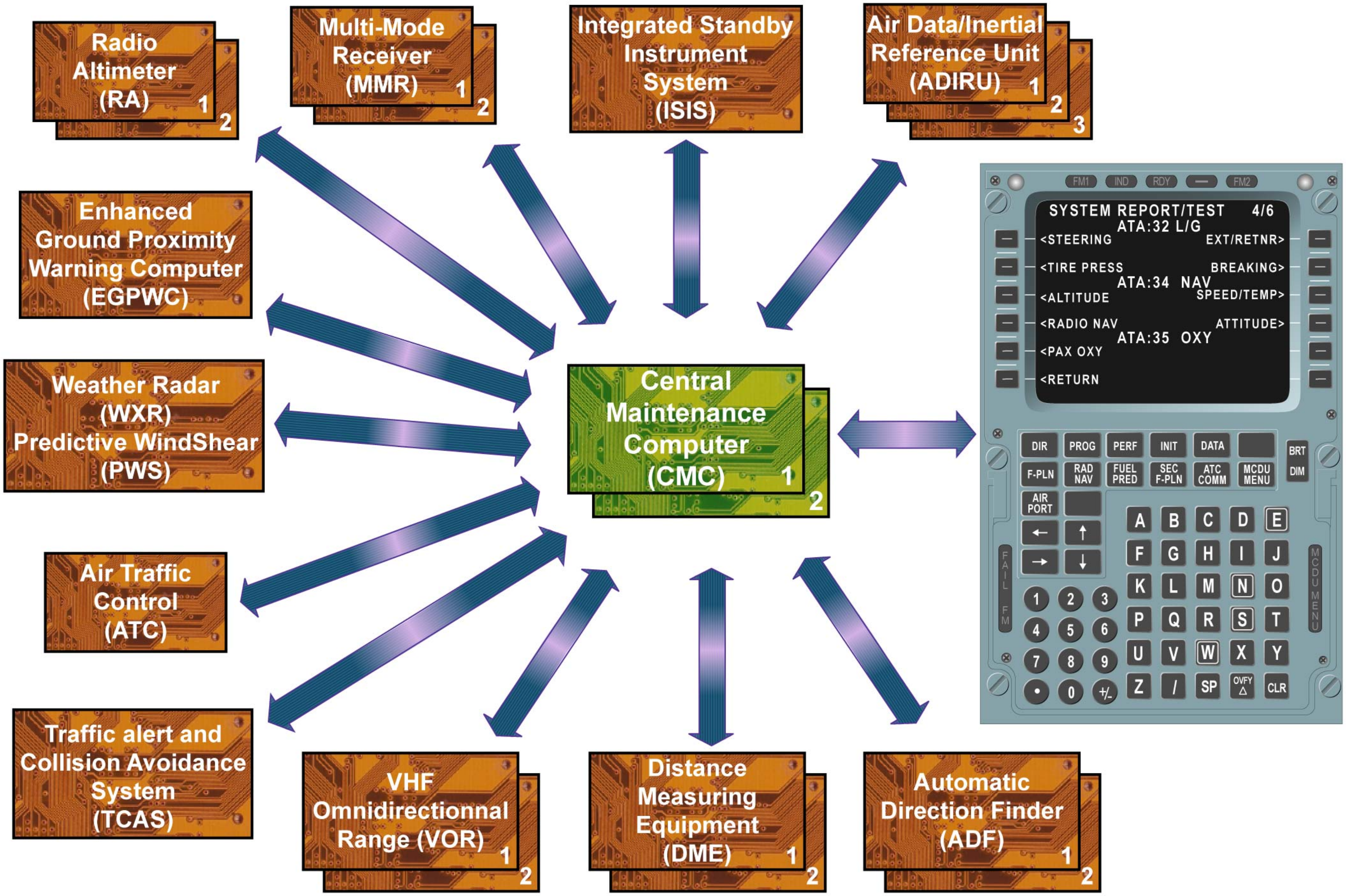
34 NAVIGATION SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

The Line Replaceable Units (LRUs) comprising the navigation systems have BITE. The BITE is located inside each of the LRUs. Each LRU provides an interface with the Central Maintenance Computer (CMC) and reports the failure and test information to its related computers and wiring. The navigation systems BITE failure information and testing is available through the MCDU SYSTEM REPORT/TEST page.



MAINTENANCE/TEST FACILITIES

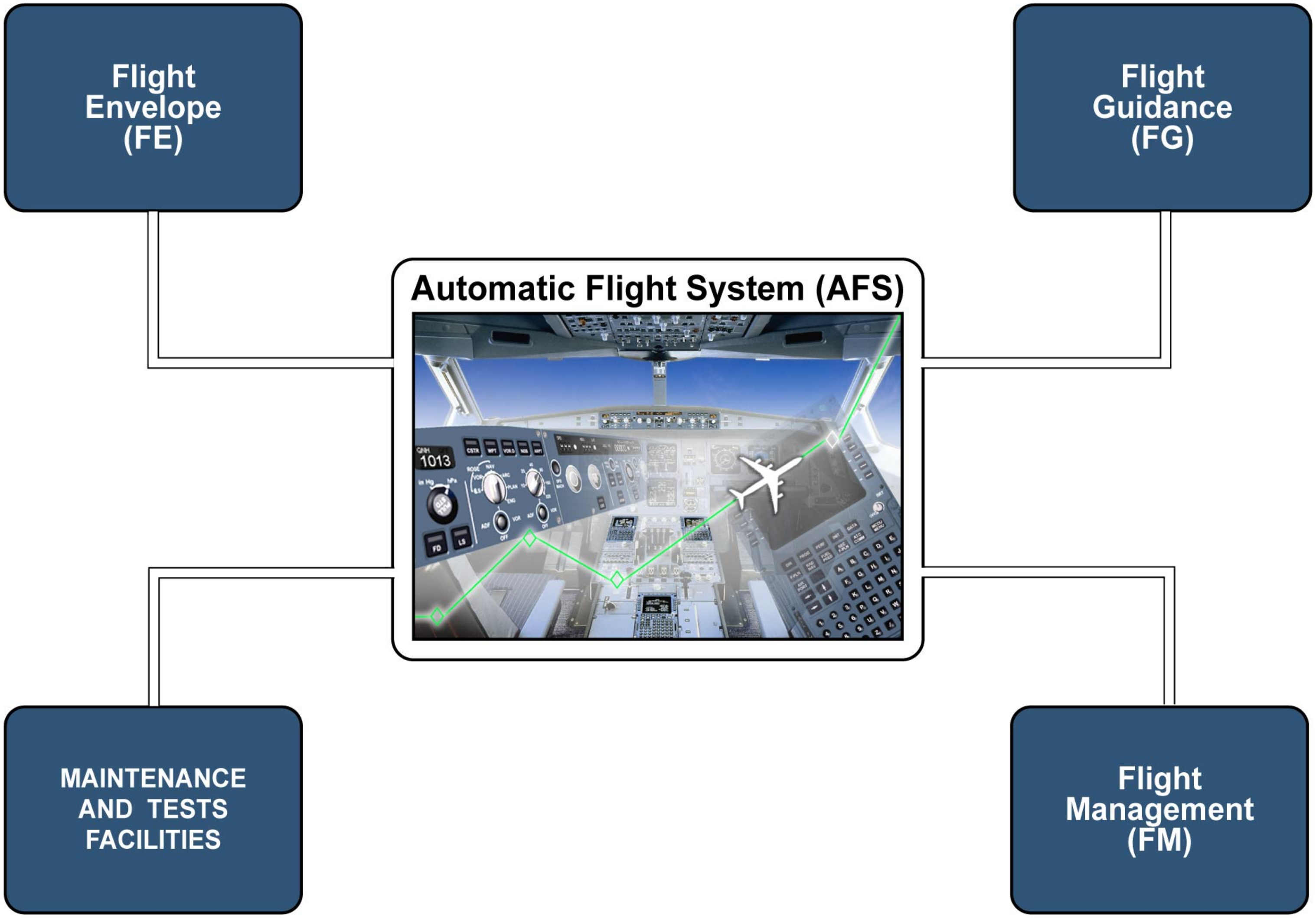
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

GENERAL

The function of the Automatic Flight System (AFS) is to reduce the crew workload induced by the aircraft trajectory and engine thrust controls, to optimize the fuel consumption and to increase flight safety. To achieve these objectives, the AFS is composed of:
- Flight Envelope (FE) functional part,
- Flight Guidance (FG) functional part,
- Flight Management (FM) functional part,
- maintenance and test facilities.

For reliability and redundancy functions, the AFS is made of two identical and interchangeable Flight Management Guidance and Envelope Computers (FMGECs). The AFS fulfills its major functions via the FMGECs. Dialog between the various functional parts is made via common memories. The AFS also fulfills the dedicated interface with the Central Maintenance System (CMS) by means of the Fault Isolation and Detection System (FIDS). In addition to the FMGECs, the AFS has:
- one Flight Control Unit (FCU),
- three Multipurpose Control & Display Units (MCDUs).

As a principle, when the AFS is active, the aircraft control is automatic. The pilots interface with the FG via the FCU for short-term actions and with the FM via the MCDUs for long-term actions. The AFS automatically controls the aircraft trajectory via the Electrical Flight Control System (EFCS) and the relevant flight controls. Note that, in manual operation, the EFCS also controls the surfaces via the same actuators from pilot side stick inputs. This is the reason why there are no longer any specific AFS actuators. The AFS also automatically controls the engine thrust via the Full Authority Digital Engine Control (FADEC). Note that, in manual operation, the FADEC also controls the engines from pilot inputs via the throttle control levers. During AFS operation, side sticks and throttle control levers do not move automatically.



GENERAL

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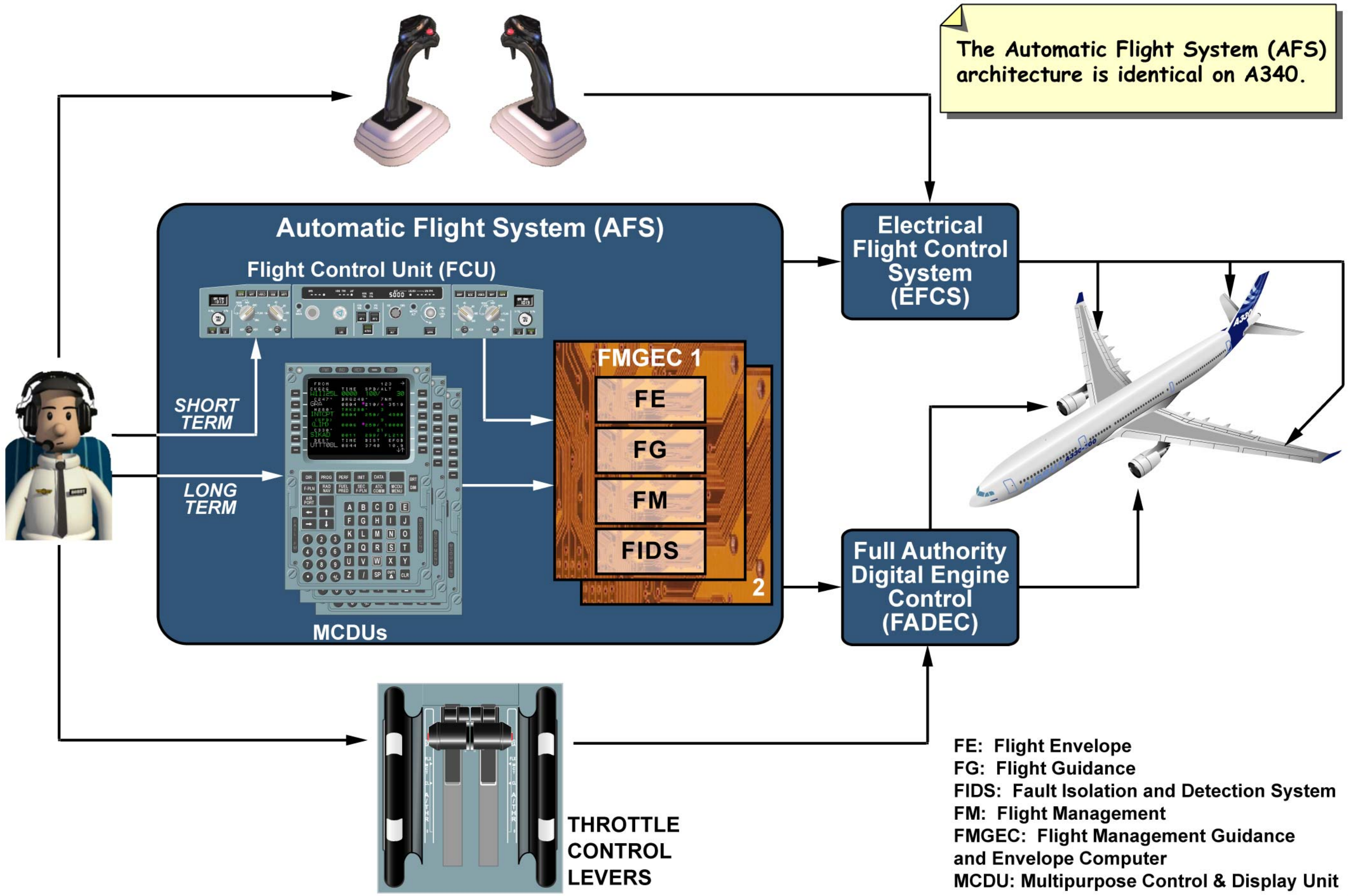
The Automatic Flight System (AFS) architecture is identical on A340.
Automatic Flight System (AFS)
Flight Control Unit (FCU)
SHORT TERM
LONG TERM
FMGEC 1
FE
FG
FM
FIDS
2
MCDUs
Electrical Flight Control System (EFCS)
Full Authority Digital Engine Control (FADEC)
THROTTLE CONTROL LEVERS
FE: Flight Envelope
FG: Flight Guidance
FIDS: Fault Isolation and Detection System
FM: Flight Management
FMGEC: Flight Management Guidance and Envelope Computer
MCDU: Multipurpose Control & Display Unit

GENERAL

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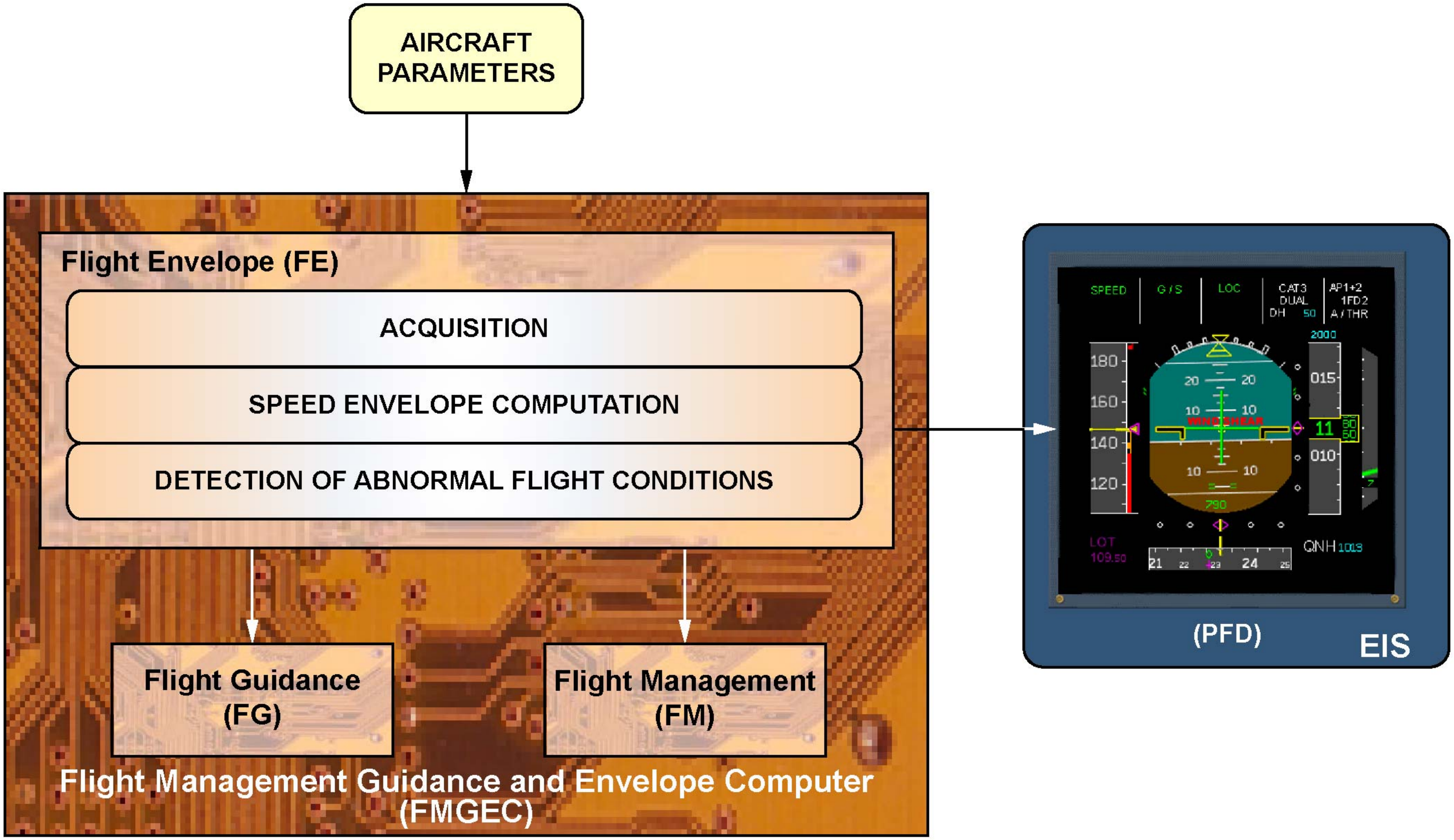
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

FLIGHT ENVELOPE

The FE part basically has:
- the acquisition and monitoring of the various aircraft parameters used by the AFS,
- the speed envelope computation,
- the detection of the abnormal flight conditions (e.g. windshear detection).

FE information is mainly displayed on the EFIS PFDs.



FLIGHT ENVELOPE

G6B08031 - G10T4T0 - FM22P6000000001

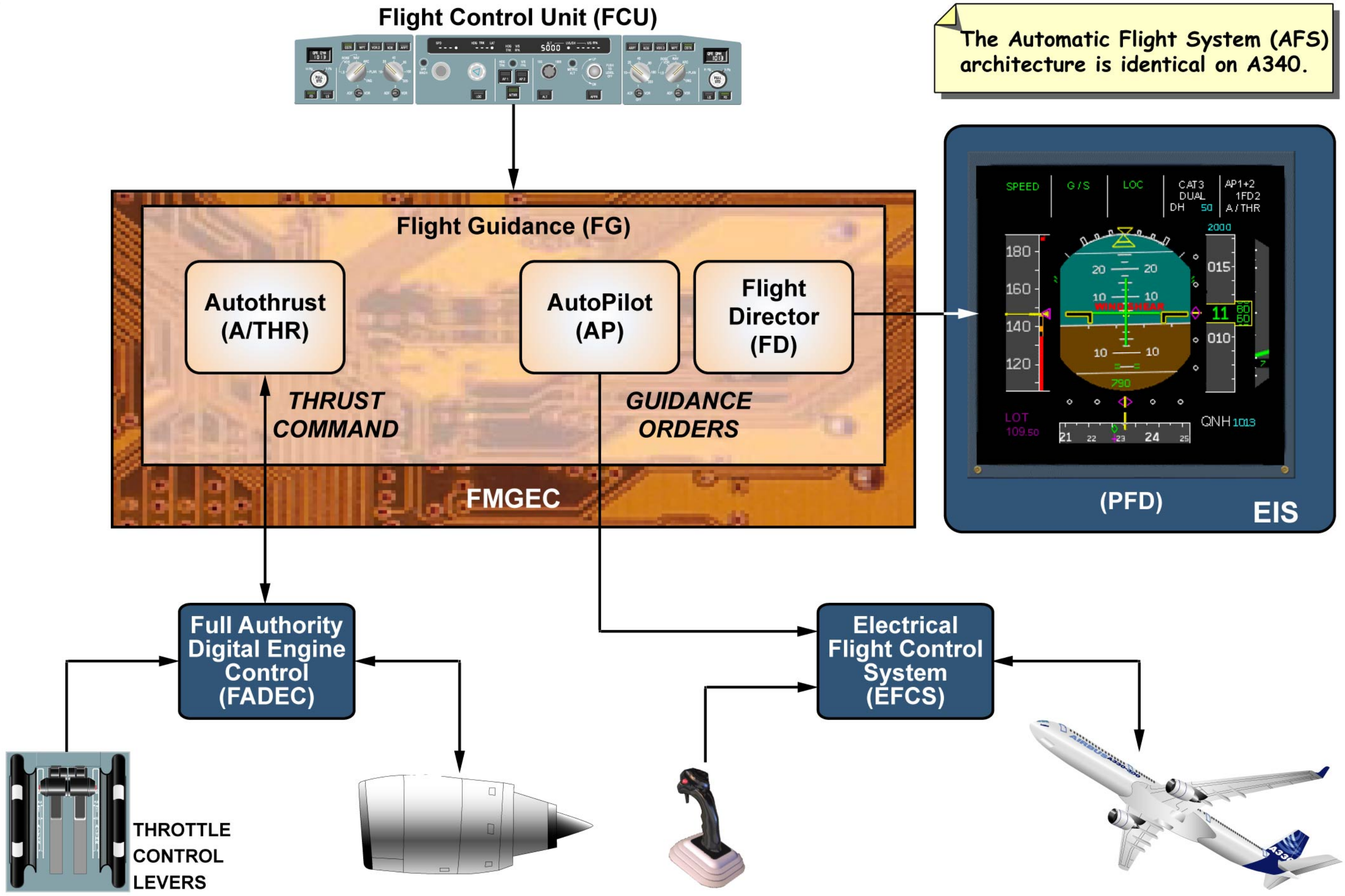
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

FLIGHT GUIDANCE

The FG part performs three functions related to the aircraft control: Autopilot (AP), Flight Director (FD) and AutoTHRust (A/THR). The AP function computes guidance orders used for automatic flight control surface deflections. The FD function displays orders that would be followed by the AP if it was engaged. The A/THR function computes the thrust command for automatic engine control.

NOTE: Within the A/THR function, the AFS no longer manages a throttle displacement but a thrust value.

Engagement/disengagement of the AP, FD and A/THR functions are controllable through the FCU. Disengagement of the AP and A/THR functions can also be done with the help of the same devices as those enabling manual control of the flight controls and the engines. FG information is mainly displayed on the EFIS PFDs.

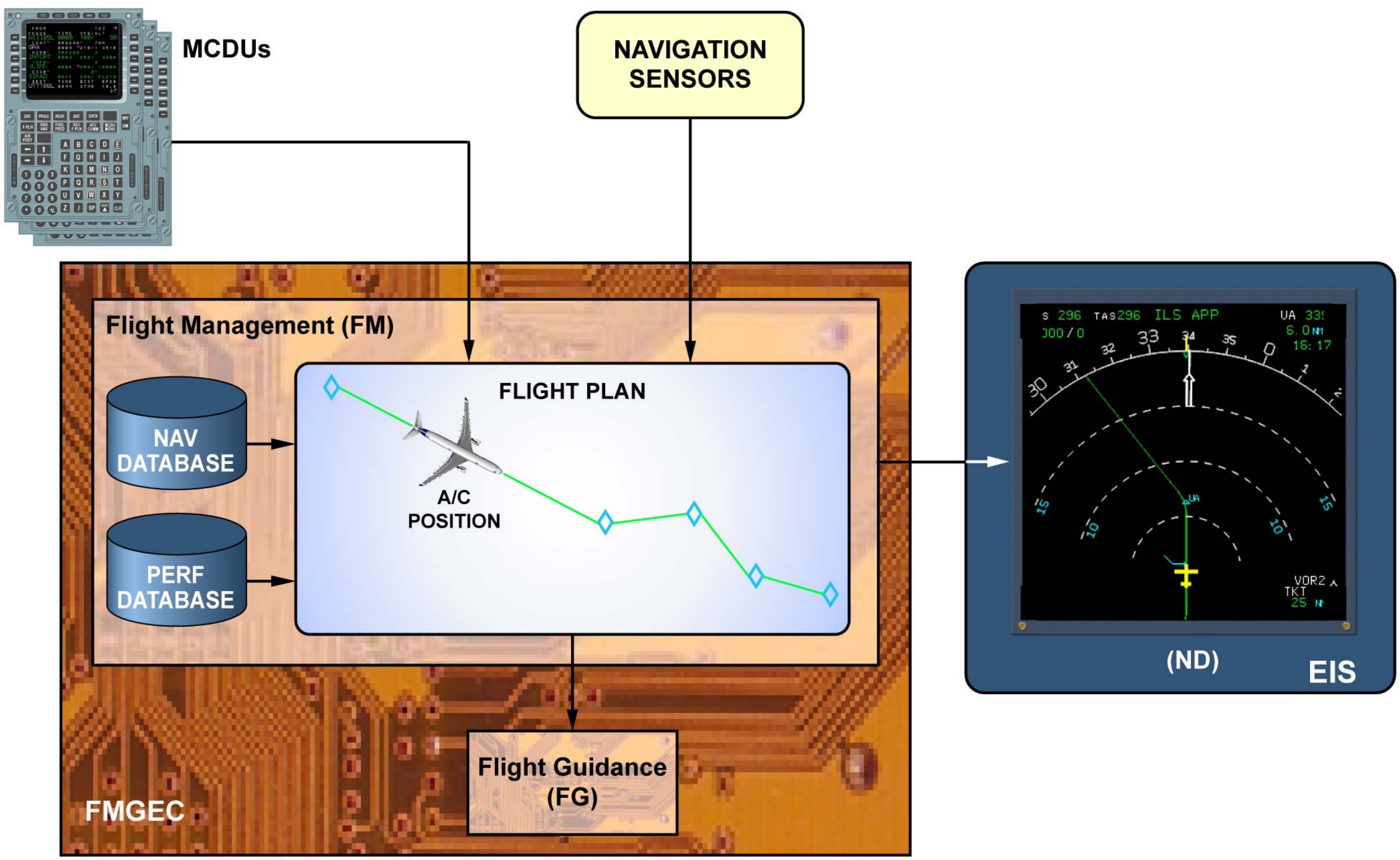


FLIGHT GUIDANCE

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

FLIGHT MANAGEMENT

The FM part performs several functions for the pilots, related to flight planning, navigation and performance optimization using a navigation database and a performance database. The MCDUs are the main interfaces between the pilots and the FM enabling them to create or select a flight plan then modify it if necessary, and monitor it in flight. A flight plan describes a complete flight from departure to arrival, including lateral information retrieved from the navigation database and vertical information computed from the performance database. In addition, a fundamental function of the FM is to calculate the position of the aircraft using several aircraft sensors. Knowing the position of the aircraft and the flight plan to be flown, the FM is able to compute the orders sent to the FG for the automatic control of the aircraft trajectory and engine thrust. Besides the MCDUs, FM information is mainly displayed on the EFIS NDs.



FLIGHT MANAGEMENT

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

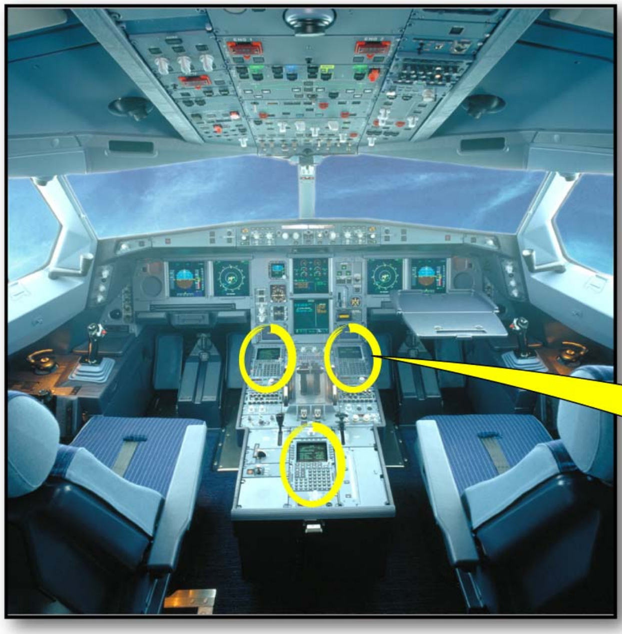
PANEL LOCATION/CONTROL AND INDICATING

The different panels used for AFS control and indicating are described in this topic.

MCDUs

Three MCDUs are located on the center pedestal. The MCDU is the primary entry/display interface between the pilot and the FM part of the FMGEC. The MCDUs exchange information not directly but via the FMGECs.

Cockpit view of the A330,
the location is identical on A340 aircraft.



MCDU

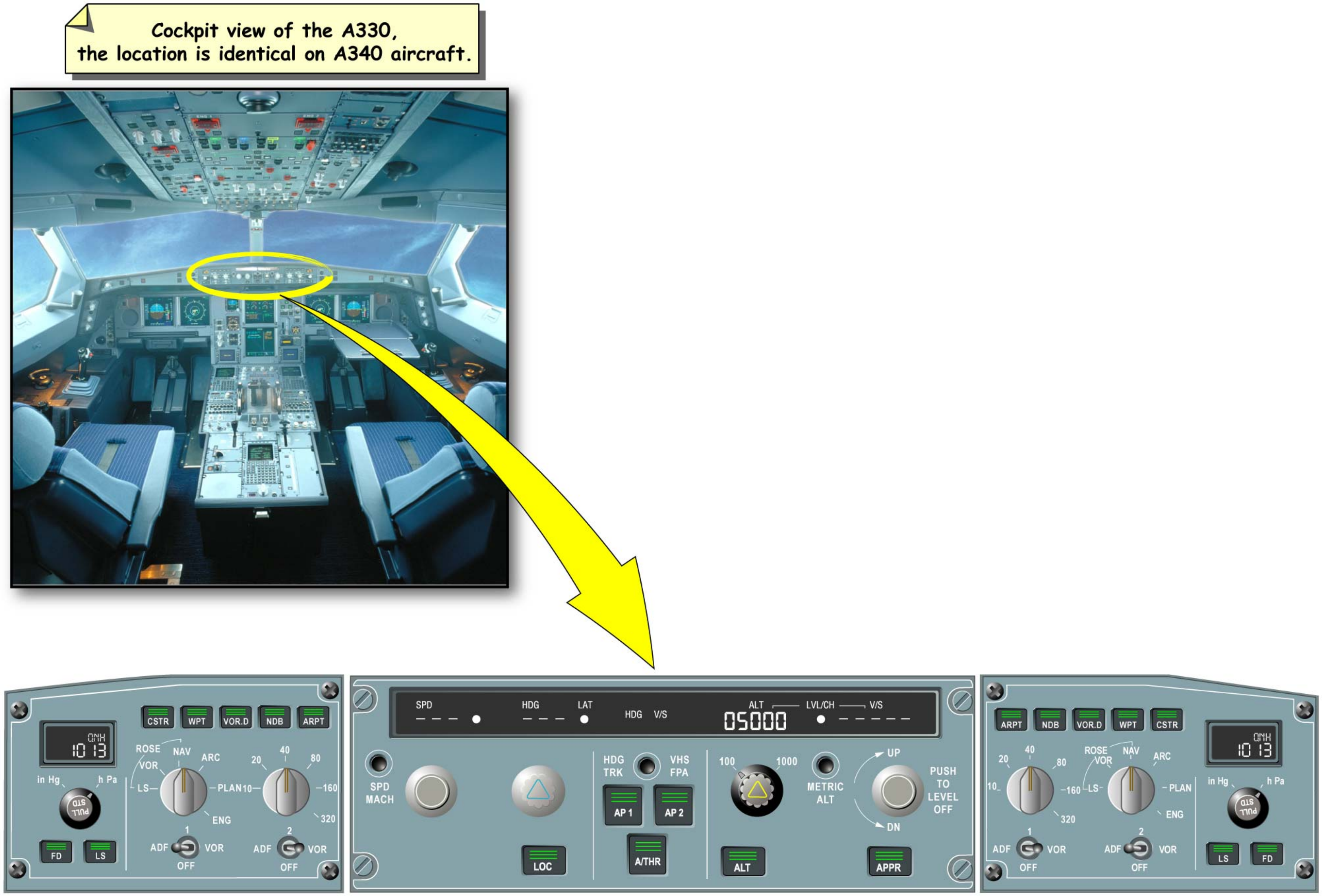
PANEL LOCATION/CONTROL AND INDICATING - MCDUS

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

PANEL LOCATION/CONTROL AND INDICATING (continued)

FCU

A FCU is installed on the glareshield. The FCU front face includes an AFS control panel between two EFIS control panels. The AFS control panel allows and displays the AP and A/THR engagement, and the selection of guidance modes and flight parameters. Each pilot has an EFIS control panel to select the display on his related EFIS screens. Speed, lateral guidance and level change can be selected by the pilot after a "pull" action or managed by the FM part after a "push" action. In that case, the parameter window shows dashes (- - - -) and a white dot will indicate that the reference is managed. An exception to this rule is when the V/S - FPA knob is pushed, a level off is immediately commanded.



Flight Control Unit (FCU)

PANEL LOCATION/CONTROL AND INDICATING - FCU

G6B08031 - G10T4T0 - FM22P6000000001

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

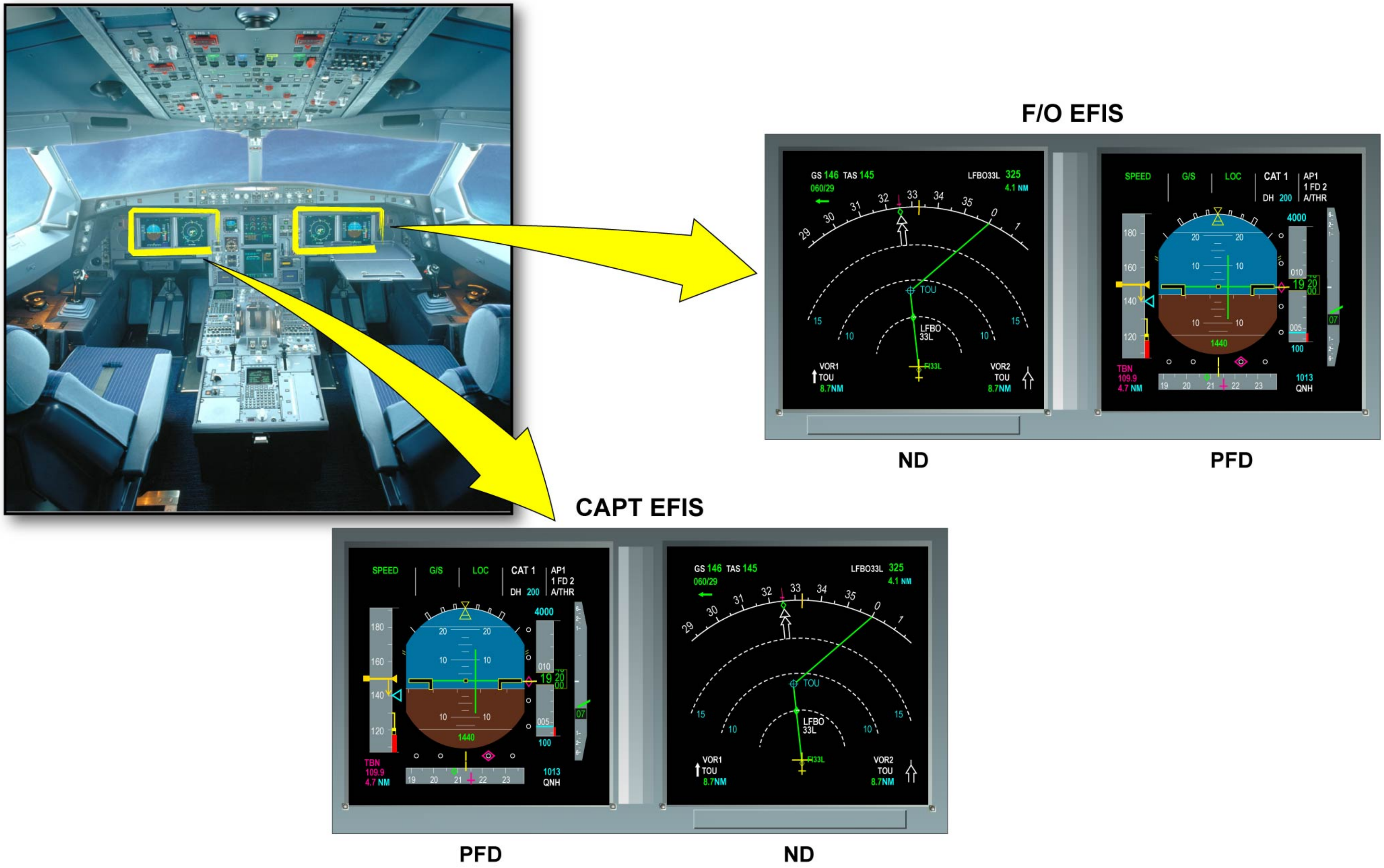
PANEL LOCATION/CONTROL AND INDICATING (continued)

EFIS DISPLAYS

Each crew member has at his disposal two EFIS displays located on the main instrument panel presenting the whole flight information: the PFD and the ND. Flight parameters for the aircraft control are displayed on the PFDs while the flight plan and navigation data are displayed on the NDs.

G6B08031 - G10T4T0 - FM22P6000000001

Cockpit view of the A330,
the location is identical on A340 aircraft.



PANEL LOCATION/CONTROL AND INDICATING - EFIS DISPLAYS

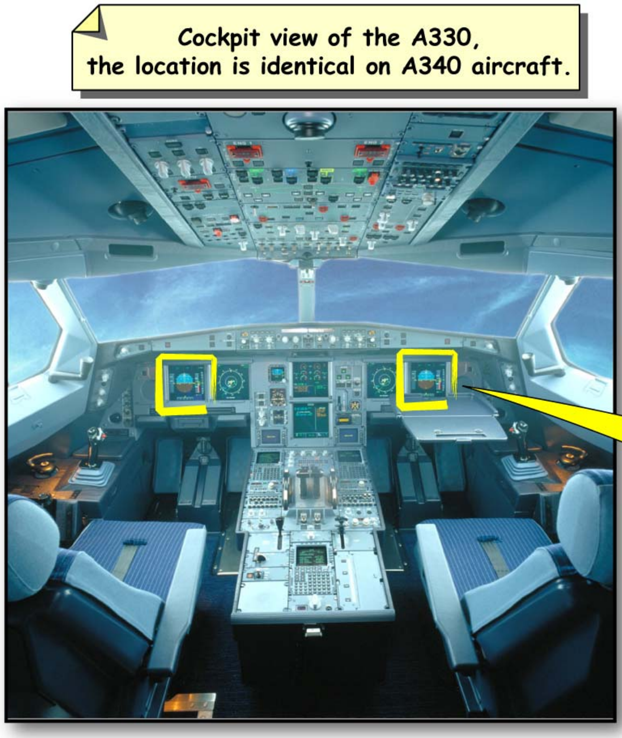
G6B08031 - G10T4T0 - FM22P6000000001

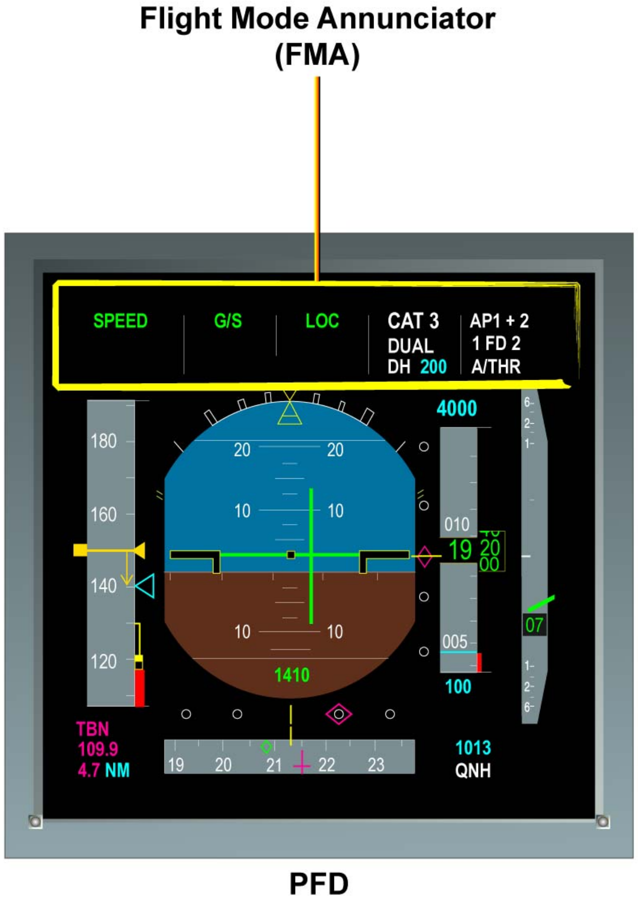
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

PANEL LOCATION/CONTROL AND INDICATING (continued)

PFD

As the main guidance instrument, the PFD displays various speeds and reference parameters used for short-term flight guidance.
The Flight Mode Annunciator (FMA) is the top part of the PFD and indicates:
- the AP, FD and A/THR engagement status,
- the AP/FD and A/THR modes,
- the automatic landing capabilities.





PANEL LOCATION/CONTROL AND INDICATING - PFD

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

PANEL LOCATION/CONTROL AND INDICATING (continued)

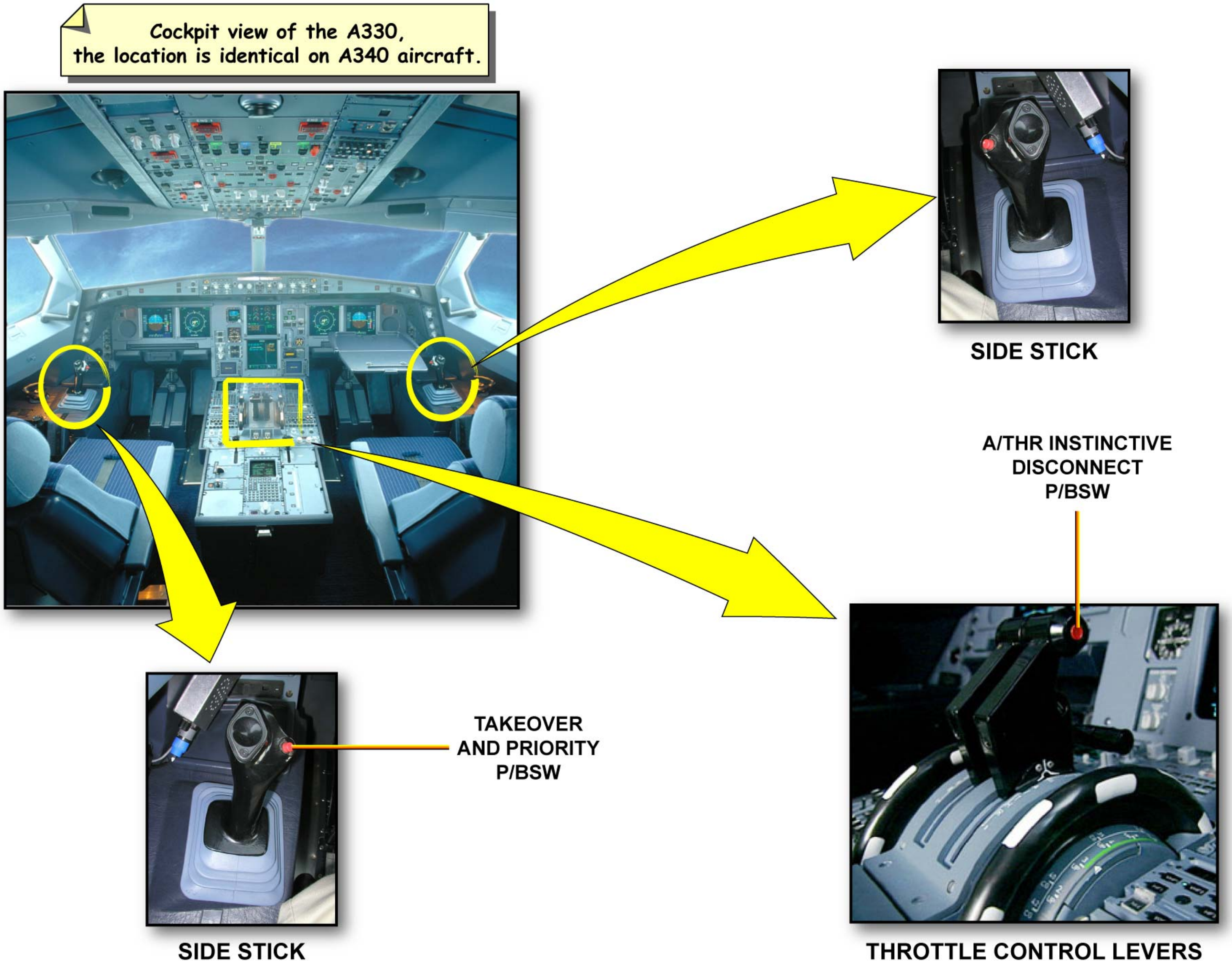
SIDE STICKS

Two side sticks are respectively located on the CAPT lateral panel and F/O lateral panel. When the AP is engaged, the side sticks are locked in the neutral position, by solenoids. The AP is disengaged, and the side sticks become free, when the red takeover and priority P/BSW on any side stick is pressed or when a force above a certain threshold is applied on any side stick.

THROTTLE CONTROL LEVERS

The engines are manually controlled by throttle control levers, which are located on the center pedestal, or automatically controlled by the A/THR system. Two red instinctive disconnect P/BSWs, located on the throttle control levers, let the A/THR function be disengaged (push either one).

NOTE: The throttle control levers never move automatically.



PANEL LOCATION/CONTROL AND INDICATING - SIDE STICKS & THROTTLE CONTROL LEVERS

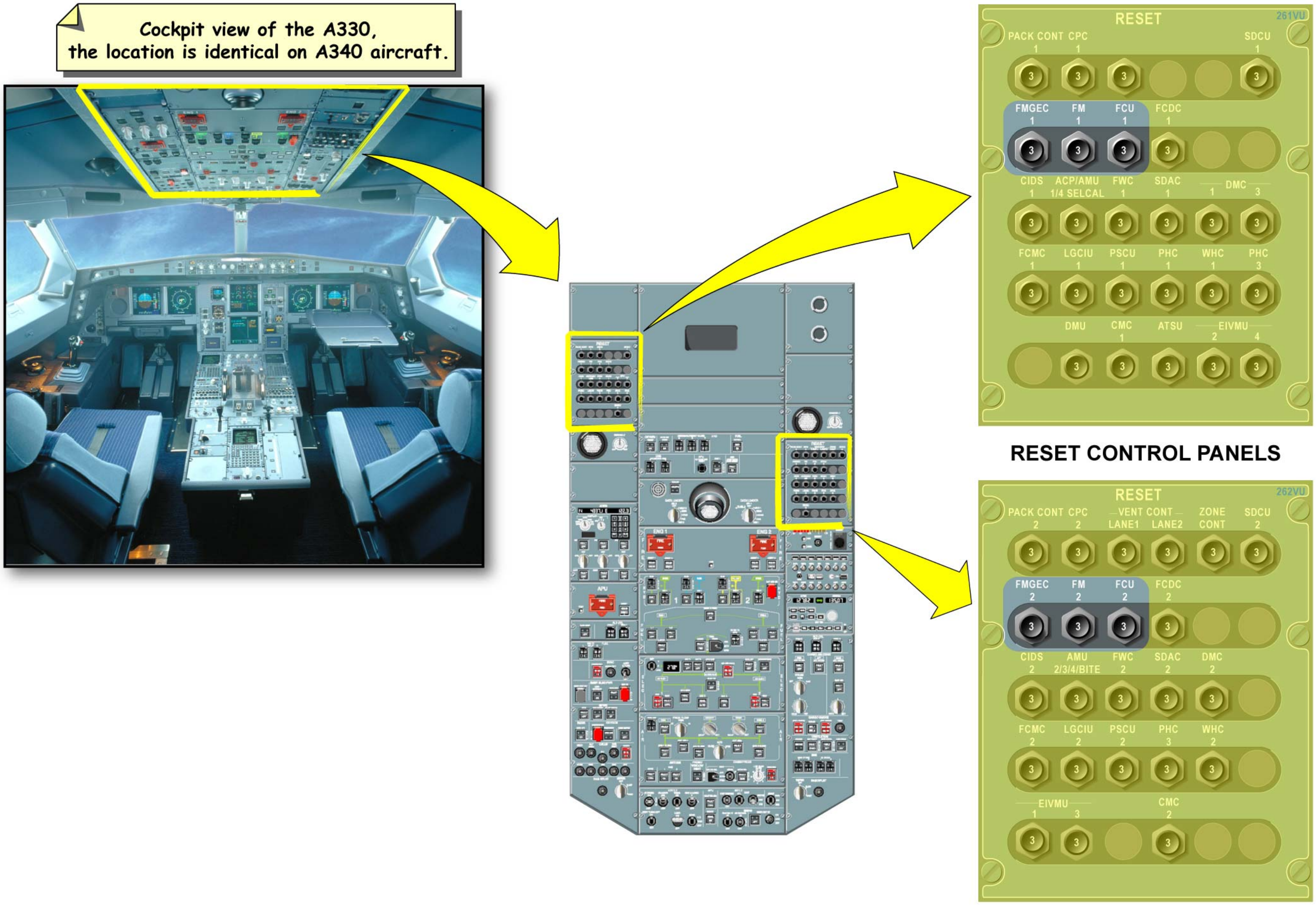
G6B08031 - G10T4T0 - FM22P6000000001

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

PANEL LOCATION/CONTROL AND INDICATING (continued)

RESET

The FMGEC reset commands enable global reset of the whole FM, FG and FE functions and their power-up test. The FM reset commands are only related to the FM functions. The FCU reset is possible from the overhead panel.

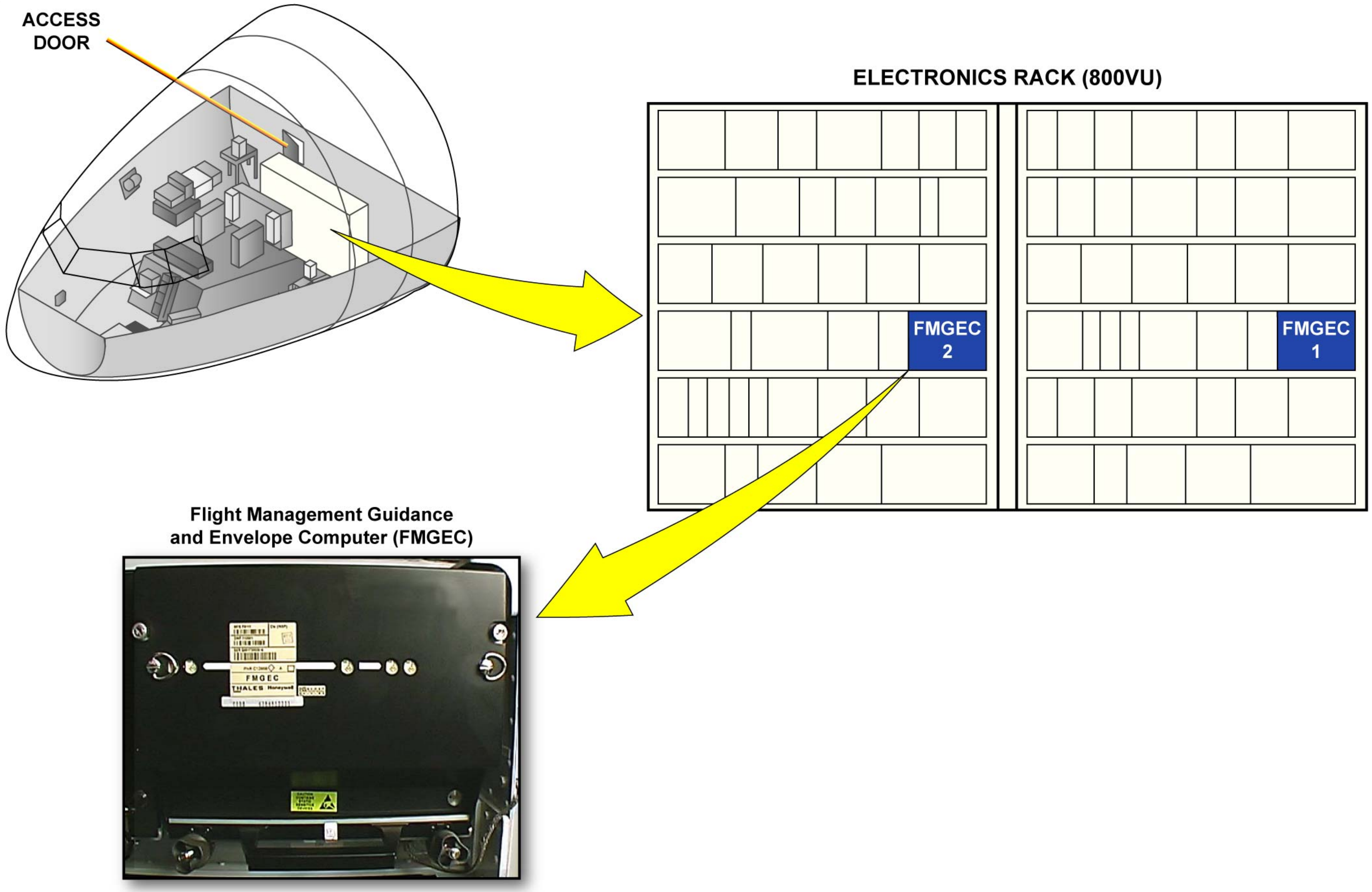


PANEL LOCATION/CONTROL AND INDICATING - RESET

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

COMPONENT LOCATION

The FGMECs, which are the main computers of the AFS, are located in the main avionics rack.



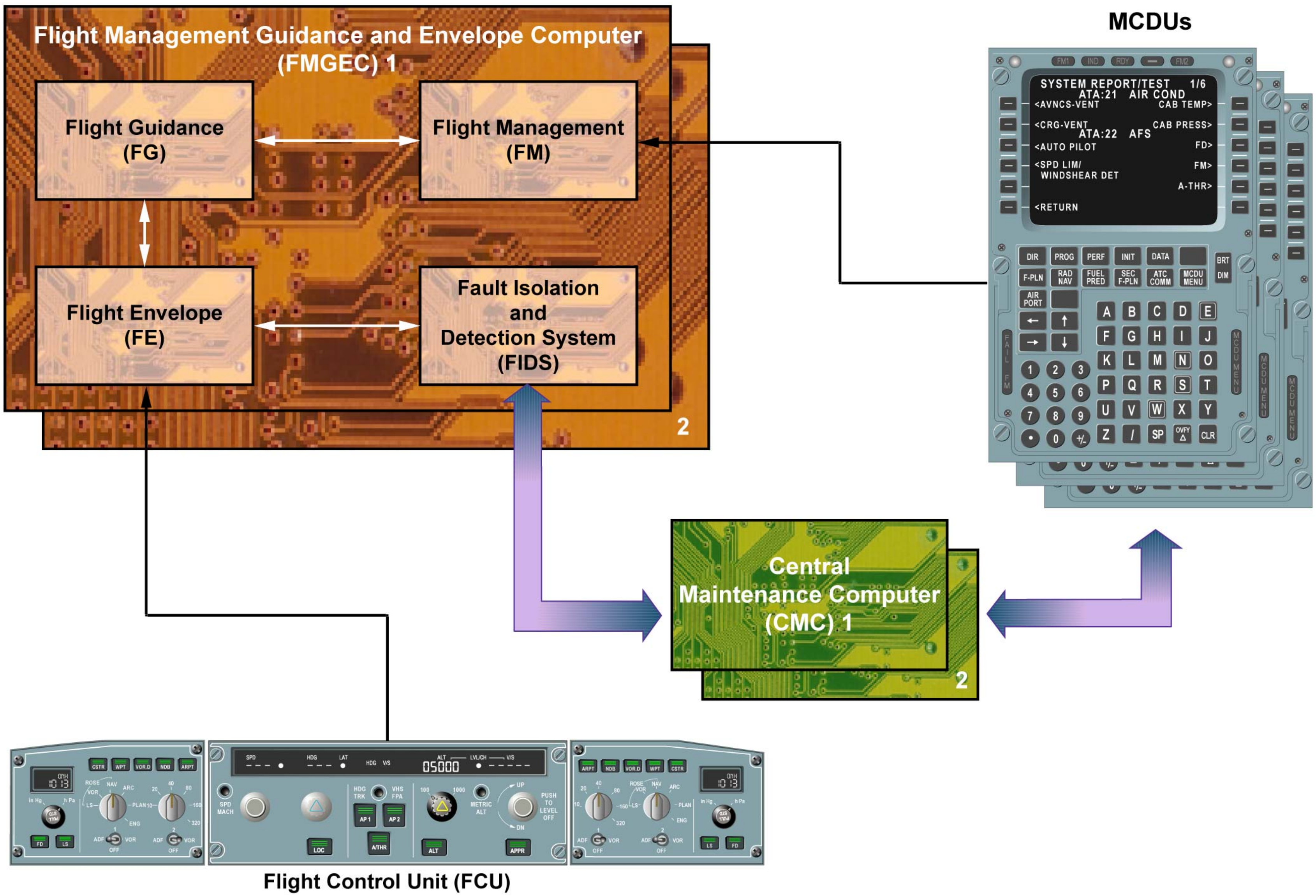
G6B08031 - G10T4T0 - FM22P6000000001

COMPONENT LOCATION

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

According to its internal architecture, each AFS computer has several BITEs. The basic function of a BITE is to detect, isolate and record failure information to help the maintenance operations. For maintenance tasks, the FIDS centralizes the failure information from the various BITE of the AFS computers and fulfills an interface between these BITEs and the Central Maintenance Computers (CMCs). The FIDS function is only active in FMGEC 1.



MAINTENANCE/TEST FACILITIES

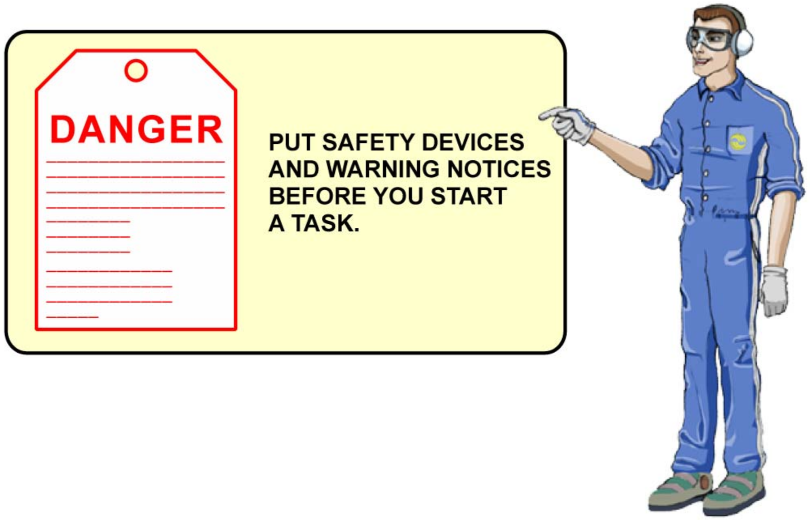
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

Make sure that all circuits in maintenance are isolated before you apply electrical power to the aircraft. Before you pressurize/depressurize a hydraulic system:
- make sure that the travel ranges of the flight control surfaces are clear,
- check that the flap/slat lever agrees with the actual flap and slat surface position,
- make sure that the speed brake selector is retracted and disarmed.

Put safety devices and warning notices before you start a task on or near:
- the flight controls,
- the flight control surfaces,
- the landing gear and the related doors,
- components that move.

Put warning notices in the cockpit to identify systems undergoing maintenance work.



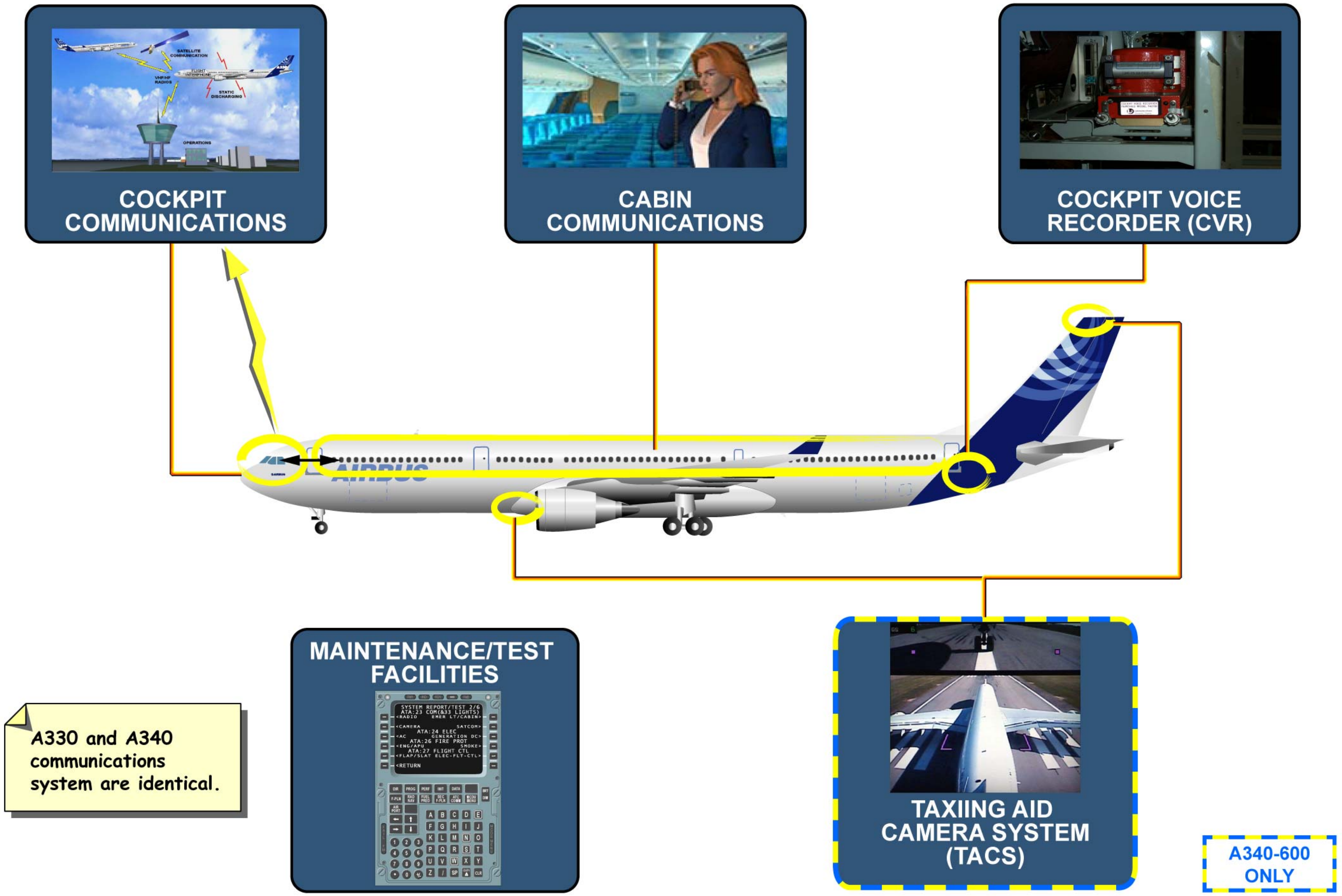
SAFETY PRECAUTIONS

23 COMMUNICATION SYSTEM PRESENTATION (1)

GENERAL

The communications system is composed of:
- cockpit communications system,
- cabin communications system,
- Cockpit Voice Recorder (CVR) system,
- Taxiing Aid Camera System (TACS), only on the A340-600.

These systems are linked to maintenance/test facilities.


COCKPIT COMMUNICATIONS
CABIN COMMUNICATIONS
COCKPIT VOICE RECORDER (CVR)
MAINTENANCE/TEST FACILITIES
TAXIING AID CAMERA SYSTEM (TACS)
A330 and A340 communications system are identical.
A340-600 ONLY

GENERAL

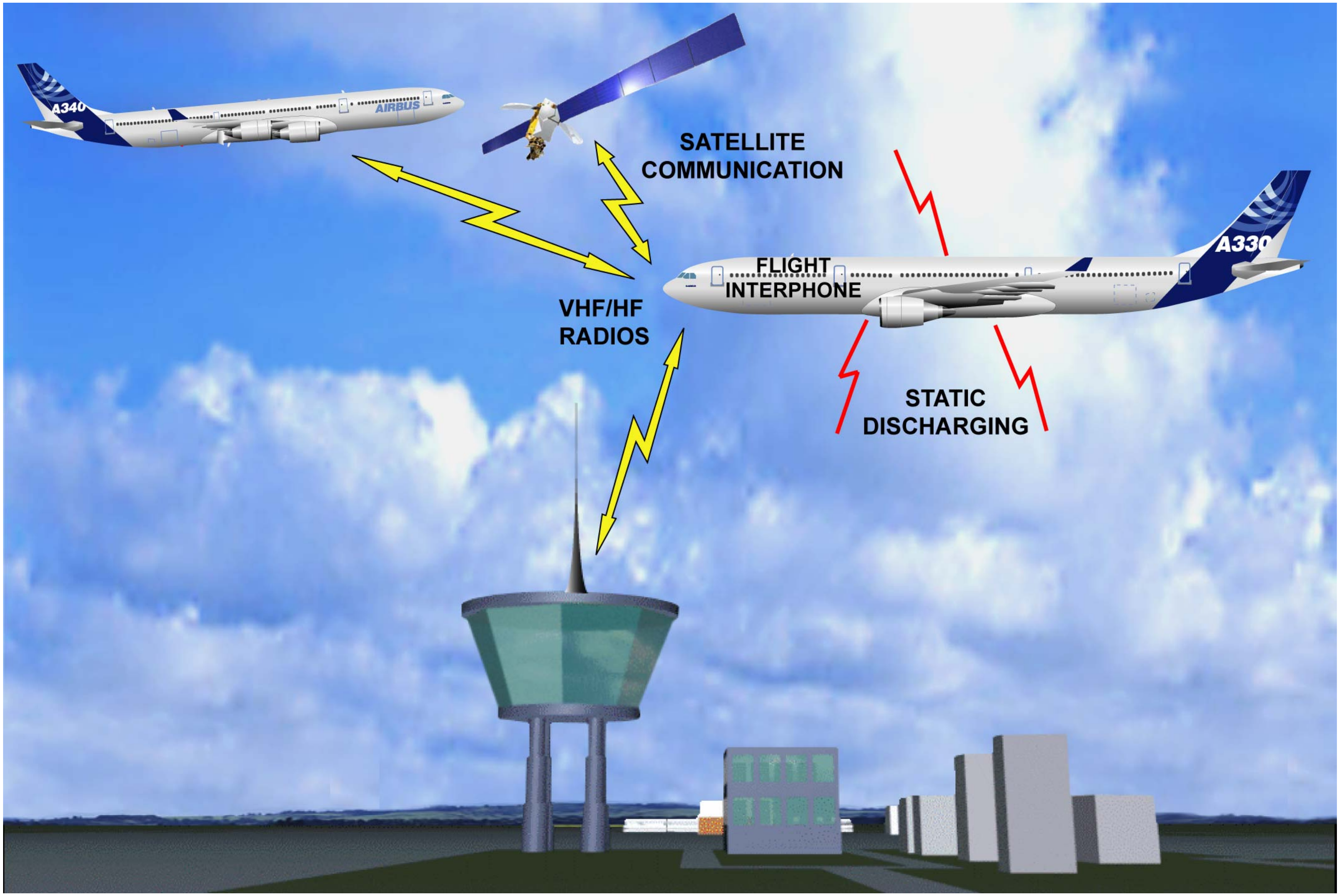
23 COMMUNICATION SYSTEM PRESENTATION (1)

COCKPIT COMMUNICATIONS

GENERAL

There are:
- two High Frequency (HF) systems for long range communication,
- three Very High Frequency (VHF) systems for short-range line of sight communication,
- a satellite communication system.

To avoid interference caused by static electricity, the A/C has a static discharging system. The flight interphone system is used for communication between the cockpit crew members and between the cockpit crew and the ground mechanic at the NLG.



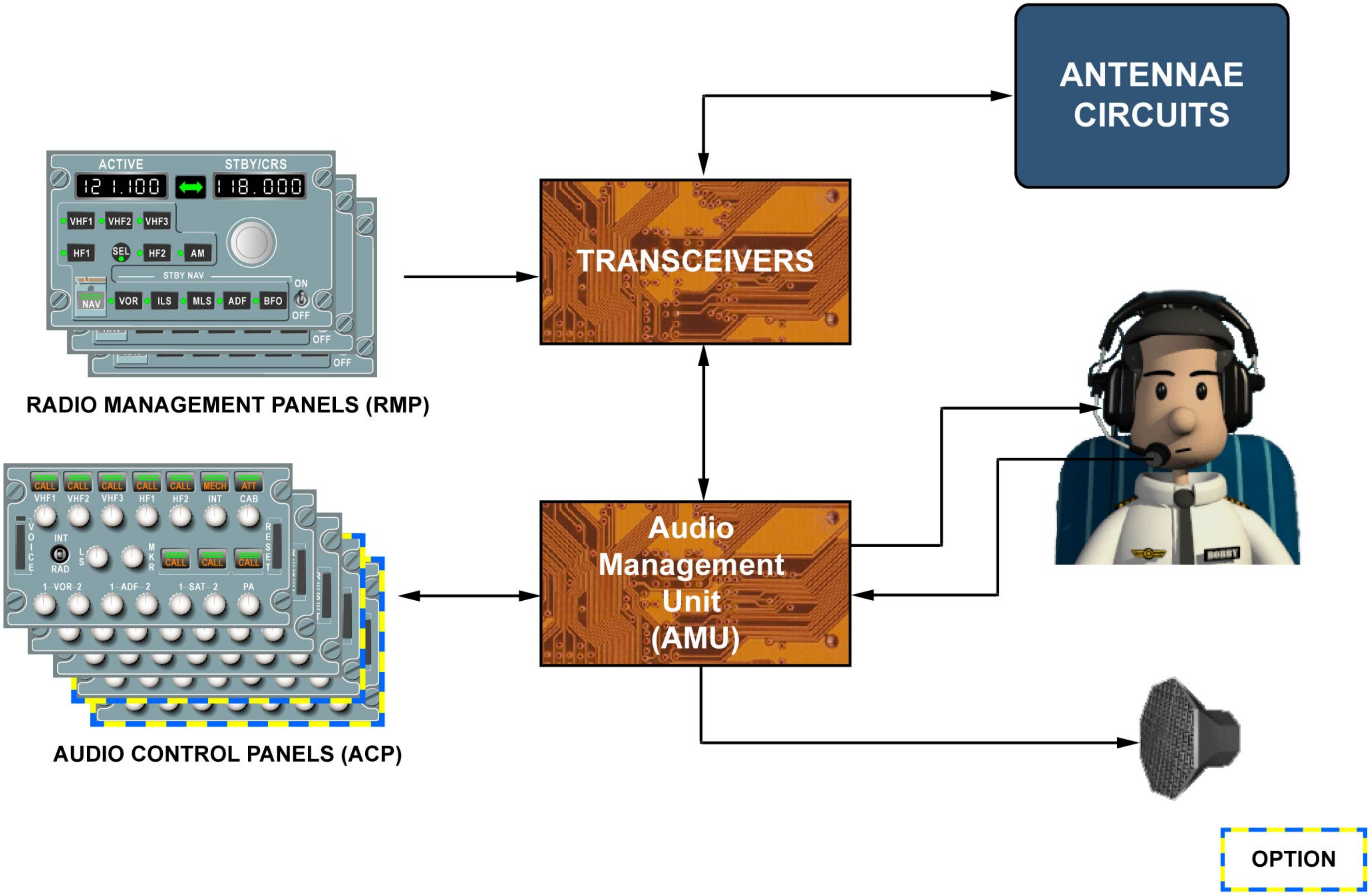
COCKPIT COMMUNICATIONS - GENERAL

23 COMMUNICATION SYSTEM PRESENTATION (1)

COCKPIT COMMUNICATIONS (continued)

SPEECH COMMUNICATION

Each HF and VHF system is composed of a transmission/reception antenna circuit and a transceiver. The transceiver transforms radio waves into audio signals or data. The HF and VHF transceiver frequencies can be selected using the Radio Management Panels (RMPs). All audio signals go through the Audio Management Unit (AMU) to be sent to the different cockpit acoustic devices. Channels and volume are selected on the Audio Control Panels (ACP).



COCKPIT COMMUNICATIONS - SPEECH COMMUNICATION

23 COMMUNICATION SYSTEM PRESENTATION (1)

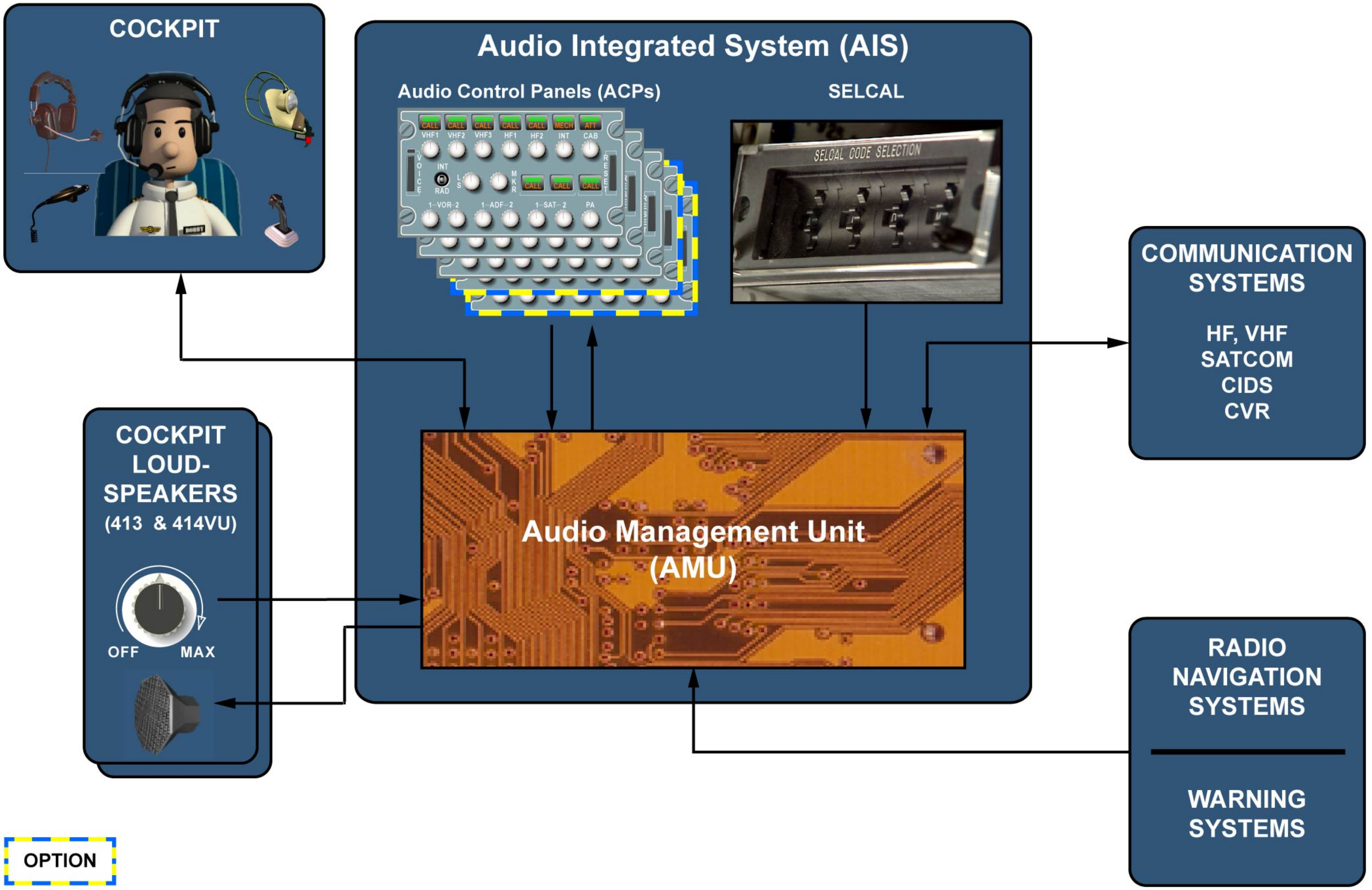
COCKPIT COMMUNICATIONS (continued)

AUDIO INTEGRATED SYSTEM

The Audio Integrating System (AIS) is composed of:
- an AMU, which manages all transfers of audio signals,
- three ACPs (plus two optional ones), which control channel and volume selection in the AMU,
- a SELCAL code panel for SELective CALling system (SELCAL) functions,
- cockpit acoustic devices like boomsets, headsets, microphones for flight crew use,
- two loudspeakers with their own individual volume control.

The AIS gives the flight crew the following audio facilities:
- communication between cockpit crew,
- radio communications,
- radio navigation facilities,
- warning facilities.

It also manages the indications for:
- SELCAL calls,
- ground crew calls,
- cabin attendant calls.



COCKPIT COMMUNICATIONS - AUDIO INTEGRATED SYSTEM

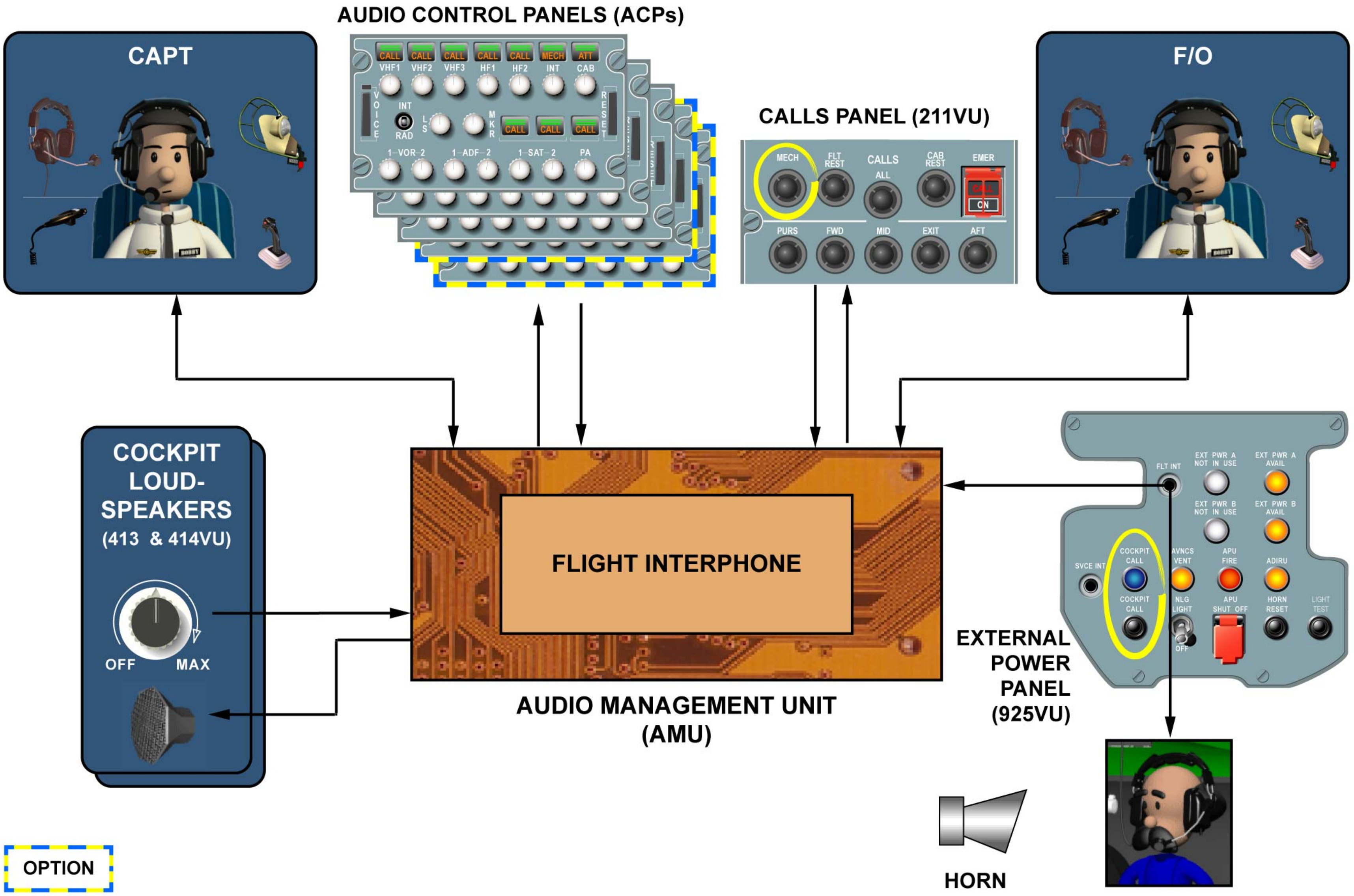
G6B08031 - G10T4T0 - FM23P7000000001

23 COMMUNICATION SYSTEM PRESENTATION (1)

COCKPIT COMMUNICATIONS (continued)

FLIGHT INTERPHONE SYSTEM

The flight interphone is used for communication links between the various crew stations in the cockpit and between the cockpit and the ground mechanic. L/G Cockpit calls are indicated by a light on the external power panel and the horn. The MECHanic light on the ACPs and a buzzer sound indicate the ground crew calls.



COCKPIT COMMUNICATIONS - FLIGHT INTERPHONE SYSTEM

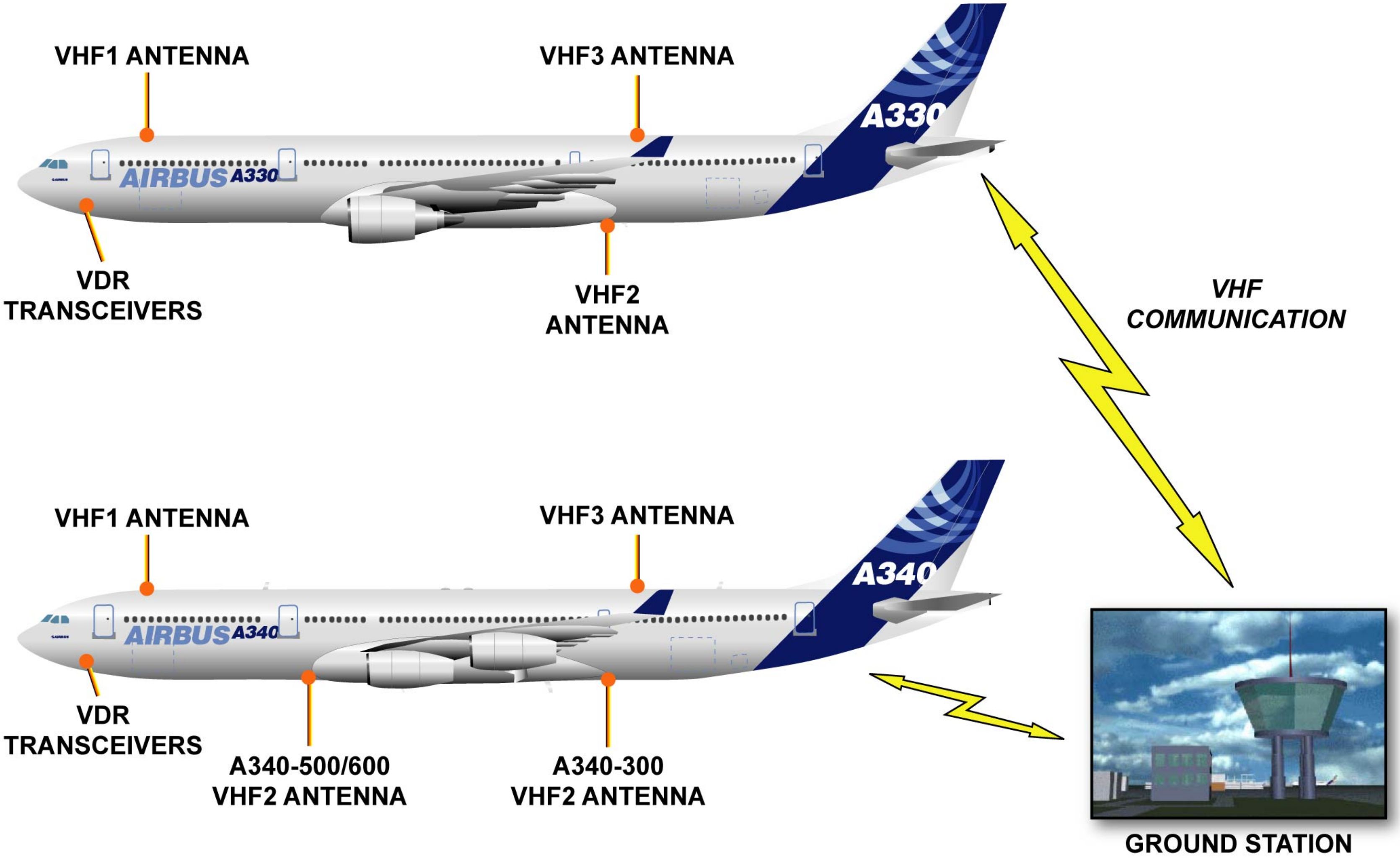
G6B08031 - G10T4T0 - FM23P7000000001

23 COMMUNICATION SYSTEM PRESENTATION (1)

COCKPIT COMMUNICATIONS (continued)

VHF

The VHF system is used for a short distance line of sight voice communication and data transmission between aircraft or between the aircraft and a ground station. The VHF system has three VHF Data Radios (VDRs): VDR 1, VDR 2 and VDR 3. Each VHF system is composed of a transceiver and an antenna. The VDR 3 transceiver is also connected to the Air Traffic Service Unit (ATSU) for direct exchange of data between the aircraft and a ground network, for example like aircraft reports or weather reports.



COCKPIT COMMUNICATIONS - VHF

G6B08031 - G10T4T0 - FM23P7000000001

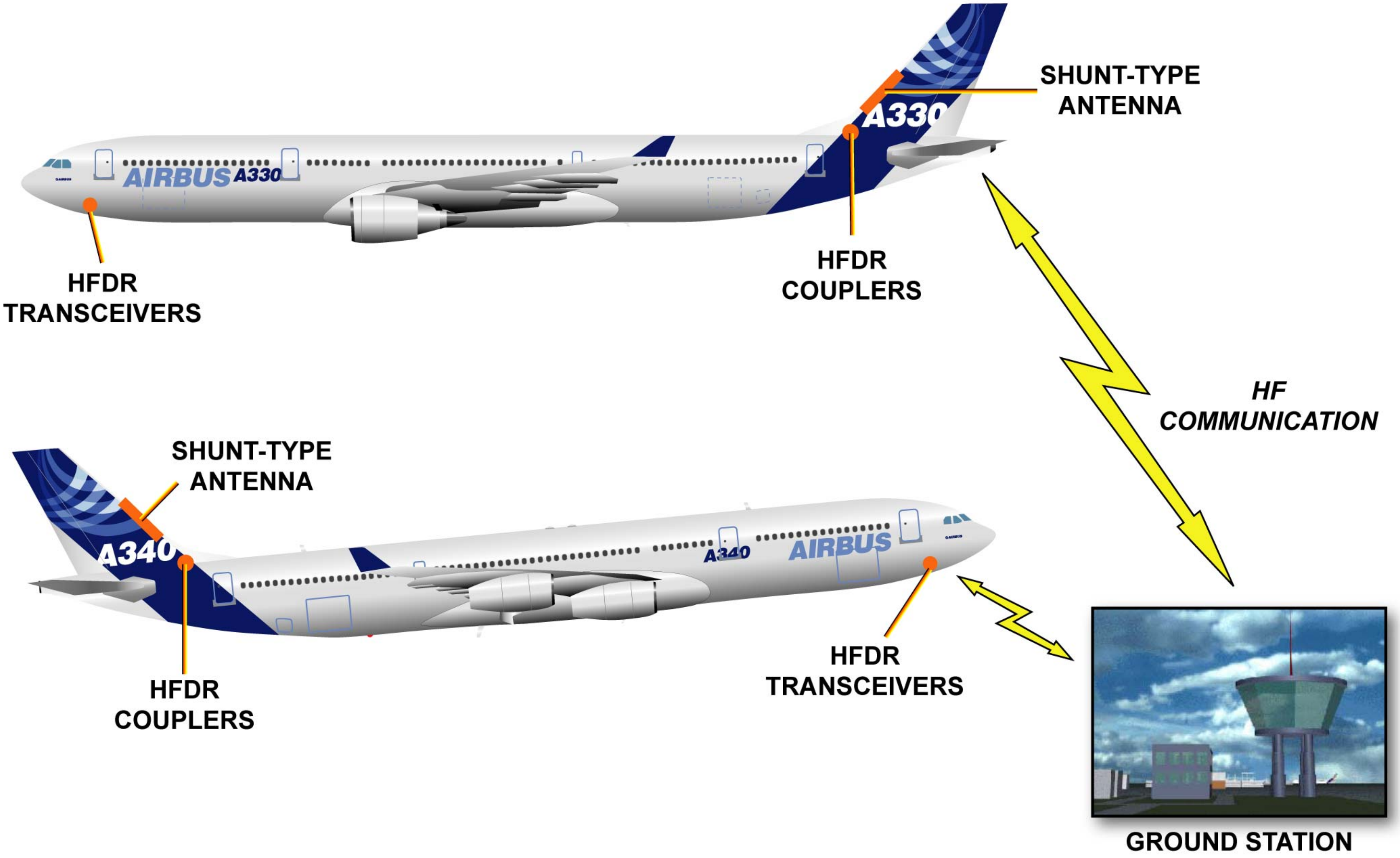
23 COMMUNICATION SYSTEM PRESENTATION (1)

COCKPIT COMMUNICATIONS (continued)

HF

The HF system is used for long distance voice communications between aircraft (in flight or on ground), or between the aircraft and a ground station. The HF system is comprised of:
- 2 High Frequency Data Radio (HFDR) transceivers,
- 2 HFDR couplers,
- 1 shunt-type antenna.

The HFDR 1 transceiver is also connected to the ATSU for direct exchange of data between the aircraft and a ground network, for example like aircraft reports or weather reports.



COCKPIT COMMUNICATIONS - HF

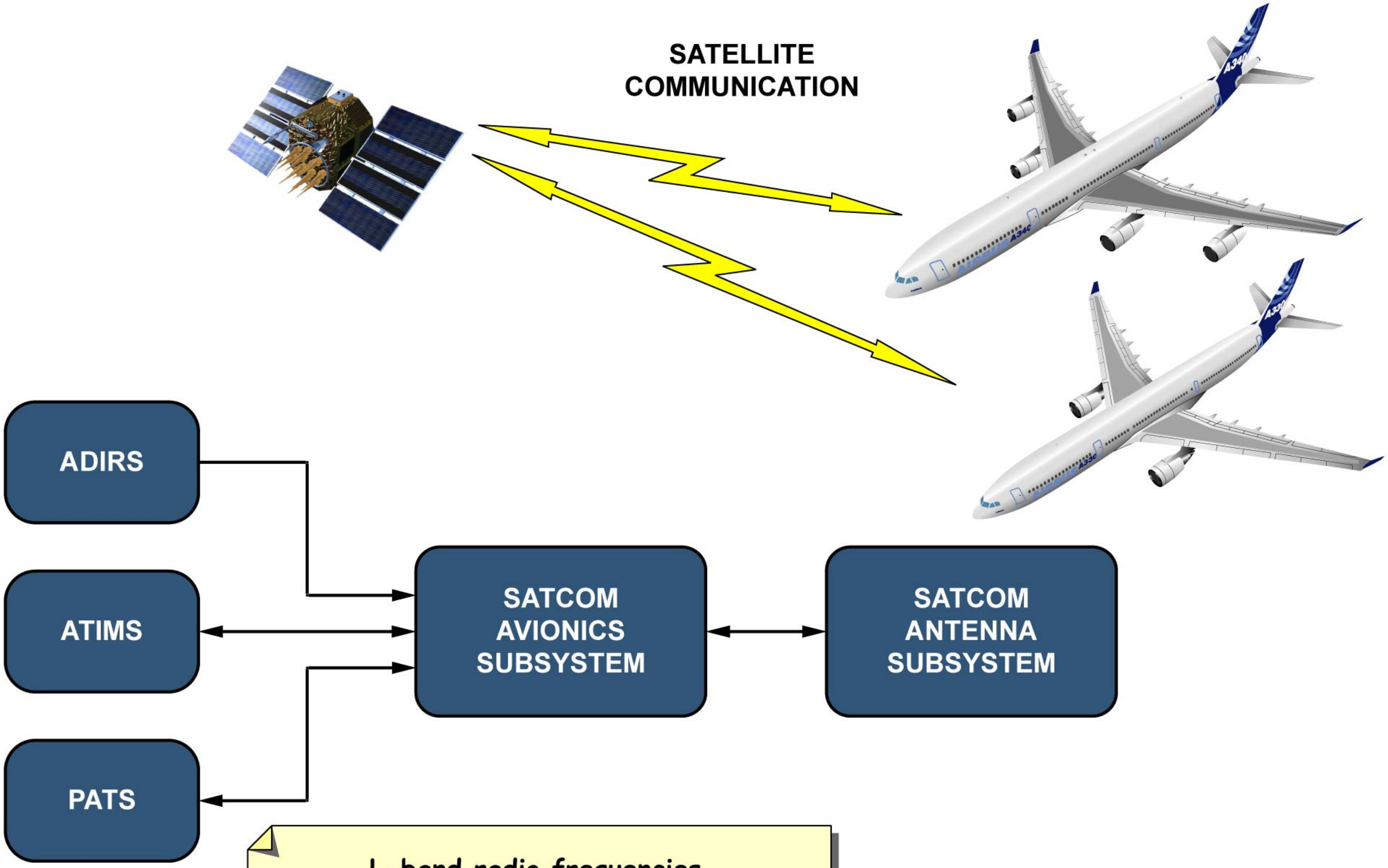
23 COMMUNICATION SYSTEM PRESENTATION (1)

COCKPIT COMMUNICATIONS (continued)

SATCOM

The aircraft has a SATCOM system. This system allows world wide communication via a satellite system, including data and passenger telephone services. The SATCOM system is composed of two subsystems:
- the avionics subsystem, which converts voice/data signals into L-band radio frequencies (and vice-versa),
- the antenna subsystem, which sends and receives L-band radio frequencies.

The SATCOM avionics subsystem is connected to:
- the Air Data/Inertial Reference System (ADIRS) for antenna control steering and doppler correction,
- the Air Traffic and Information Management System (ATIMS) for cockpit data transmission,
- the Passenger Air-to-Ground Telephone System (PATS) for cabin fax/telephone capabilities.



L-band radio frequencies

Transmission: from 1.6255 GHz to 1.6605 GHz

Reception: from 1.5300 GHz to 1.5590 GHz

ADIRS: Air Data/Inertial Reference System

ATIMS: Air Traffic and Information Management System

PATS: Passenger Air-to-Ground Telephone System

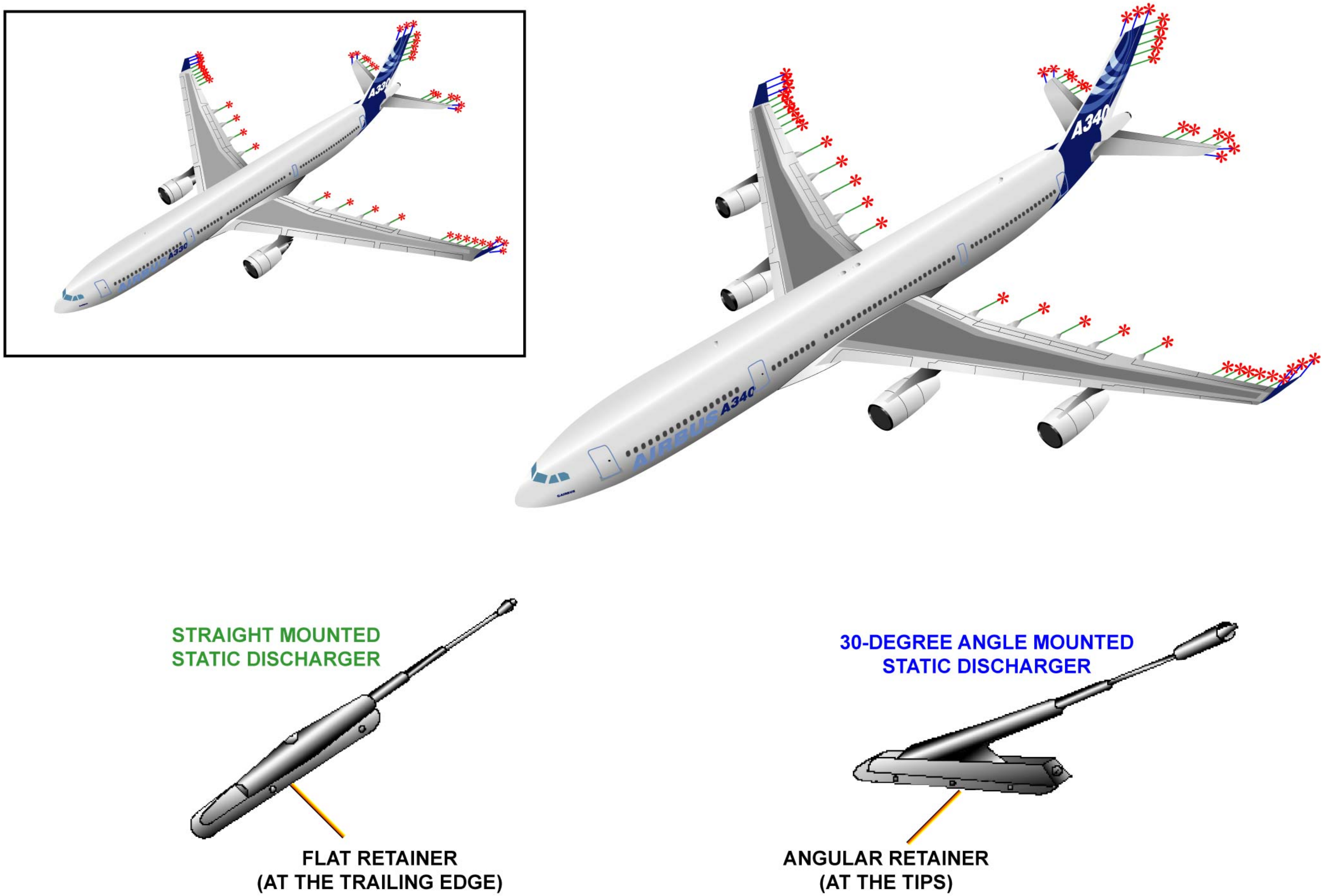
COCKPIT COMMUNICATIONS - SATCOM

23 COMMUNICATION SYSTEM PRESENTATION (1)

COCKPIT COMMUNICATIONS (continued)

STATIC DISCHARGING SYSTEM

During flight, the aircraft becomes charged with static electricity. Random discharges of this electricity cause interference in the communication and navigation systems. Installation of static dischargers at selected points on the fuselage, decreases the effects of the discharge interference. These points are typically located on the trailing edges of the flight control surfaces. Depending on the position of the dischargers there are 2 types of static discharge mounting, those being a straight mount, and a 30-degree angle mount.



COCKPIT COMMUNICATIONS - STATIC DISCHARGING SYSTEM

G6B08031 - G10T4T0 - FM23P7000000001

23 COMMUNICATION SYSTEM PRESENTATION (1)

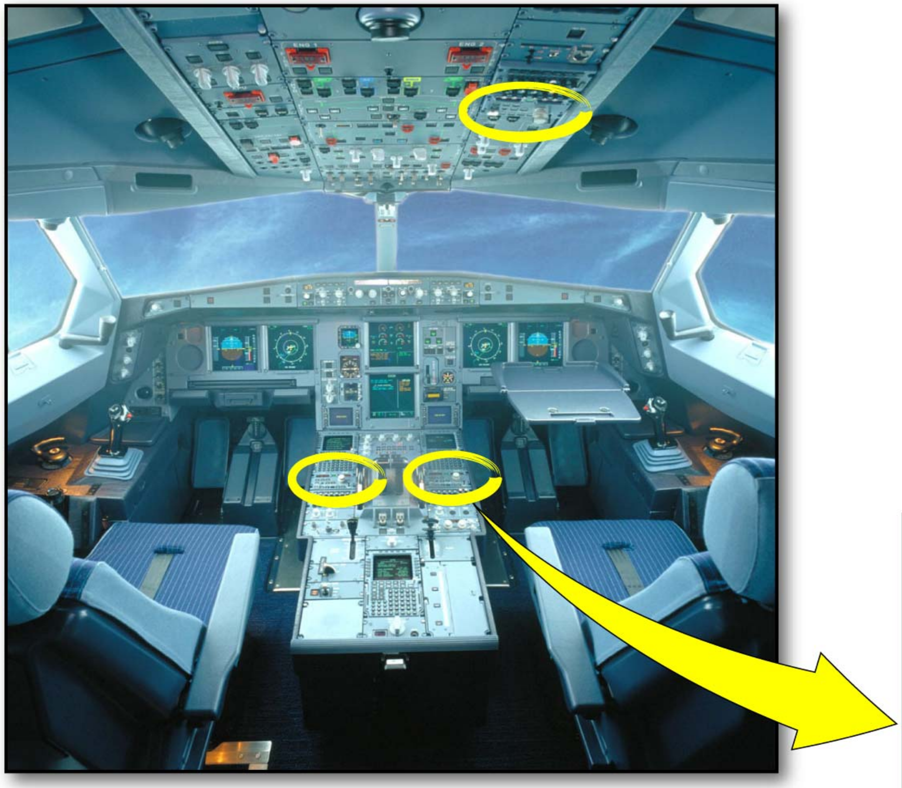
COCKPIT COMMUNICATIONS (continued)

CONTROL AND INDICATING

The RMPs give the capability of tuning all communication radios. The frequencies are tuned by using the 2 concentric knobs. There are two RMPs located on the center pedestal and a third one on the overhead panel. Any RMP can tune any communication radio but each one is normally dedicated to a particular radio.
- RMP 1 is dedicated to VDR 1,
- RMP 2 is dedicated to VDR 2,
- RMP 3 is dedicated to VDR 3 and HFDR 1/HFDR 2.

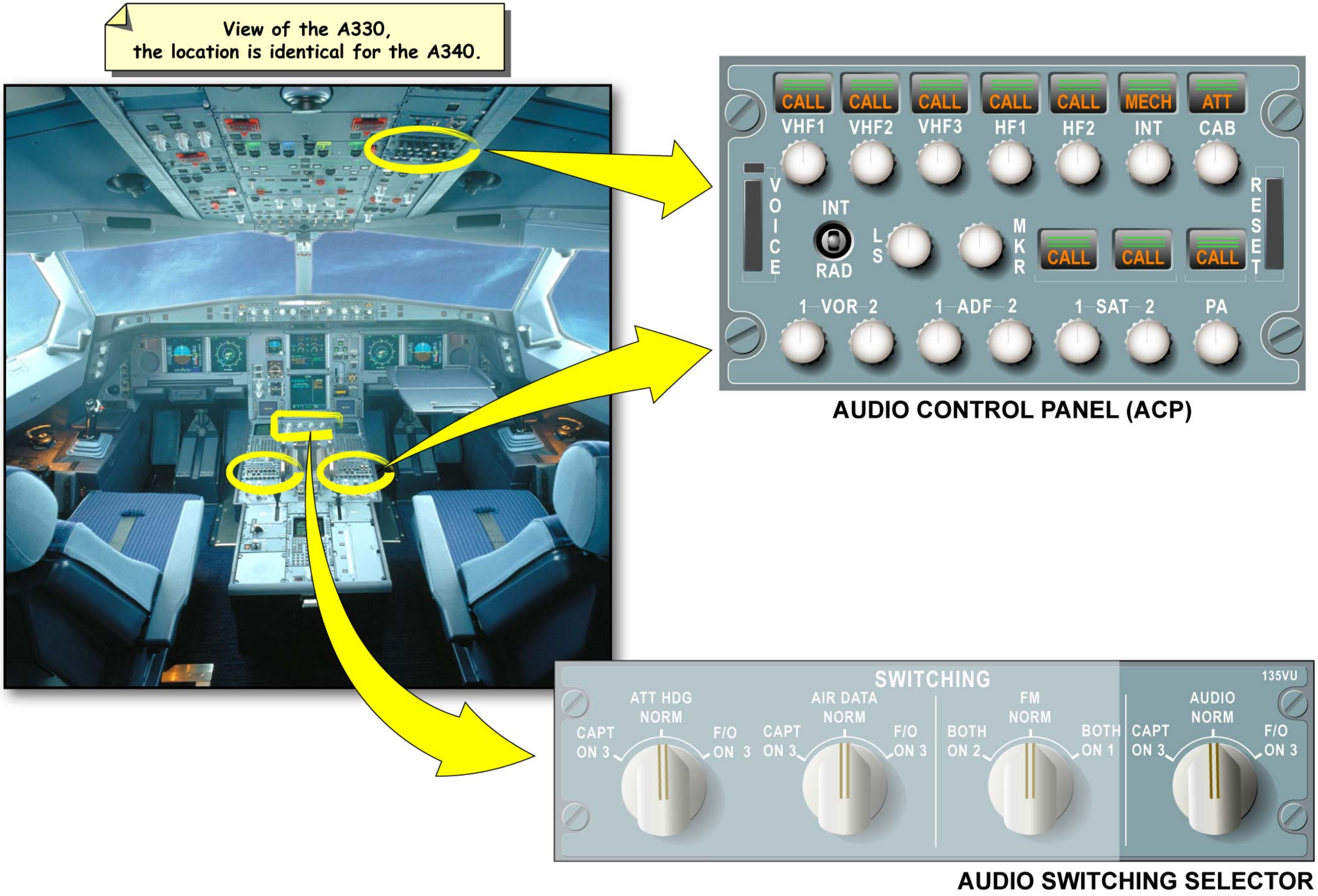
The ACPs control the channel and volume of transmission/reception. There are three ACPs located next to an RMP. Two are located on the center pedestal, a third one on the overhead panel. The CAPT or F/O can use the third occupant ACP to replace a faulty ACP. A manual switching is then required.
The CALLS panel lets the cockpit crew gain the attention of a ground mechanic or the cabin crew by triggering visual and audio signals. For mechanic call the horn will sound, for cabin crew a high low chime will be broadcasted in respective areas. The EVACuation panel is located on the overhead panel in the cockpit. It allows the evacuation command be activated from the cockpit only or from the cockpit and the pursers station.

View of the A330,
the location is identical for the A340.

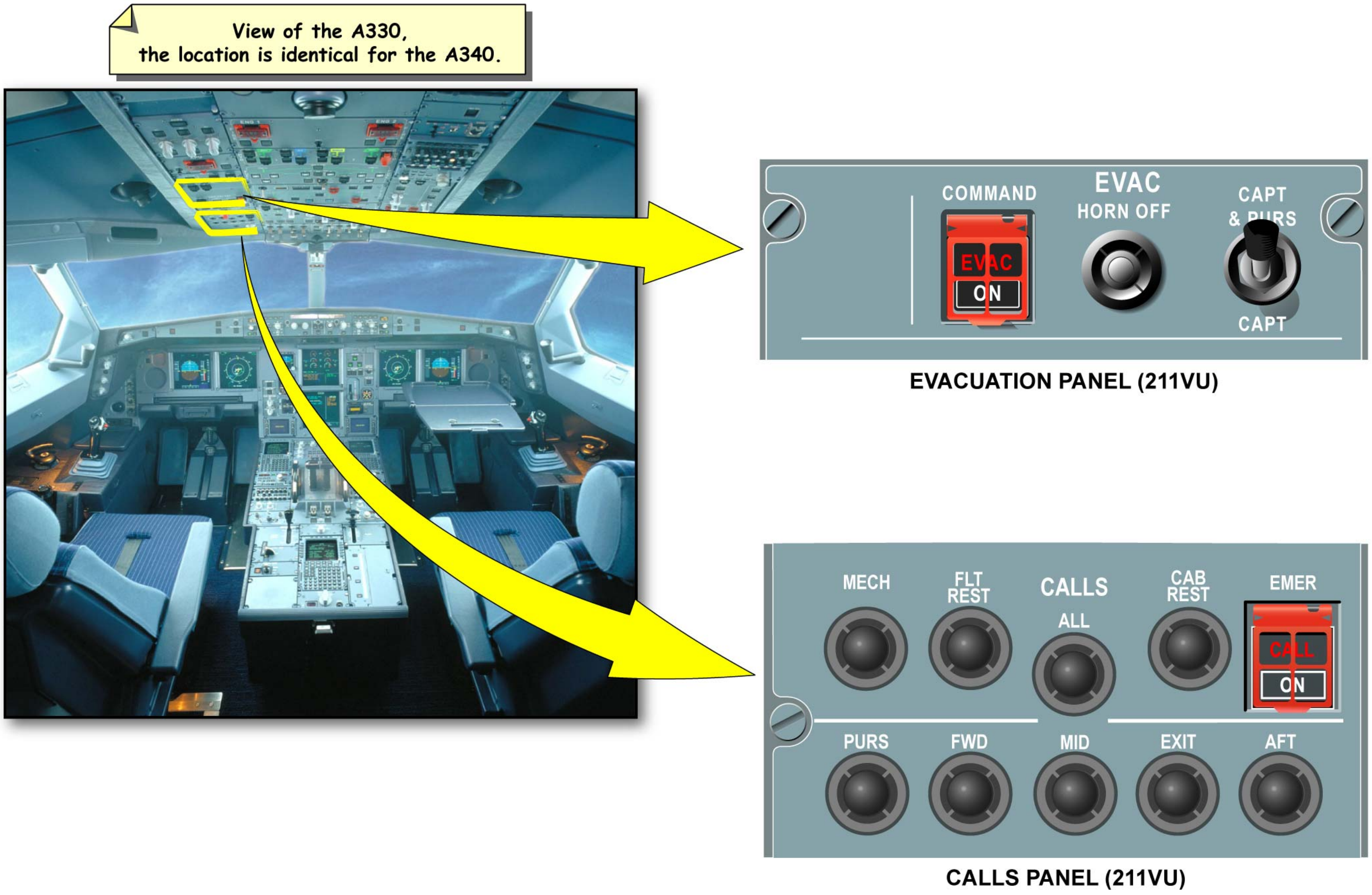


RADIO MANAGEMENT PANEL (RMP)

COCKPIT COMMUNICATIONS - CONTROL AND INDICATING



COCKPIT COMMUNICATIONS - CONTROL AND INDICATING



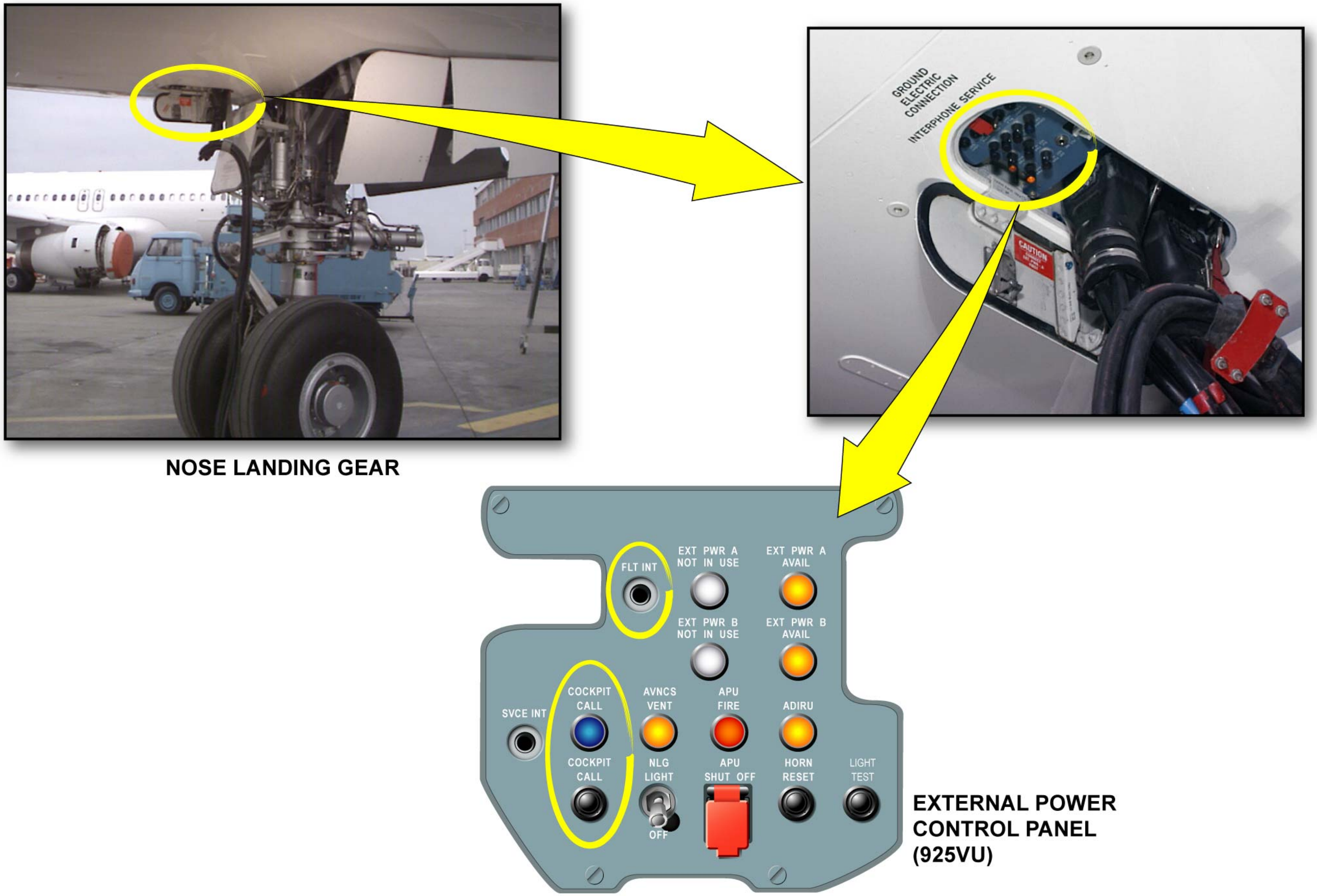
COCKPIT COMMUNICATIONS - CONTROL AND INDICATING

23 COMMUNICATION SYSTEM PRESENTATION (1)

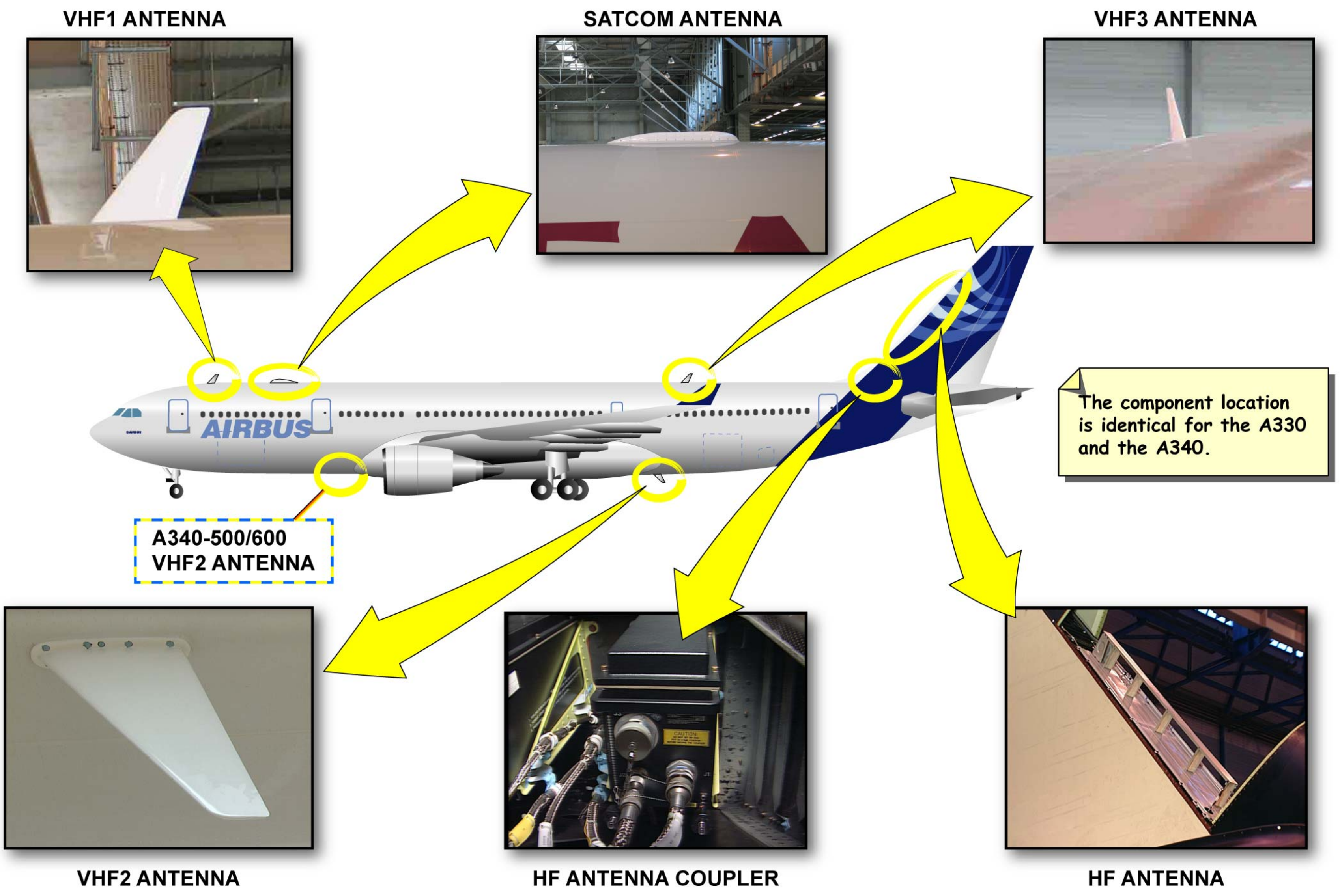
COCKPIT COMMUNICATIONS (continued)

COMPONENT LOCATION

The flight interphone function makes interphone links between pilots and the ground mechanic at the jack connection on the external power control panel.
All the communication antennae are located on the outer skin of the aircraft.
The HFDR transceivers and the VDR transceivers are located in the avionics compartment.
The SATCOM subsystems High Power Amplifier (HPA) and Diplexer/Low Noise Amplifier (D/LNA) are located in the cabin ceiling.
The Beam Steering Unit (BSU) is located in the avionics bay electronics rack 800VU.
The SELCAL code panel, the AMU, the Satellite Data Unit (SDU) and the Radio Frequency Unit (RFU) Line Replaceable Units (LRUs) are also located in the avionics compartment.

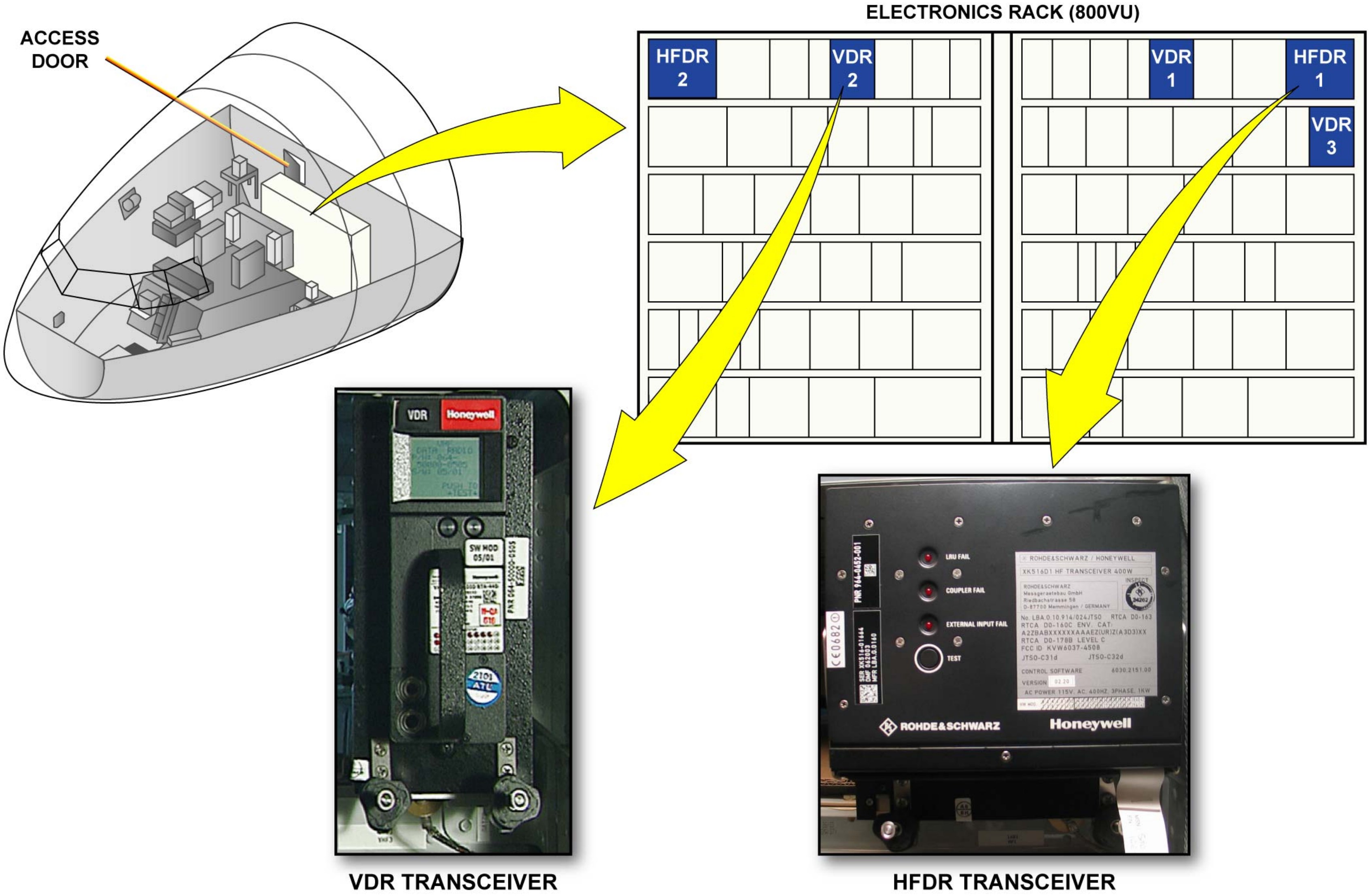


COCKPIT COMMUNICATIONS - COMPONENT LOCATION



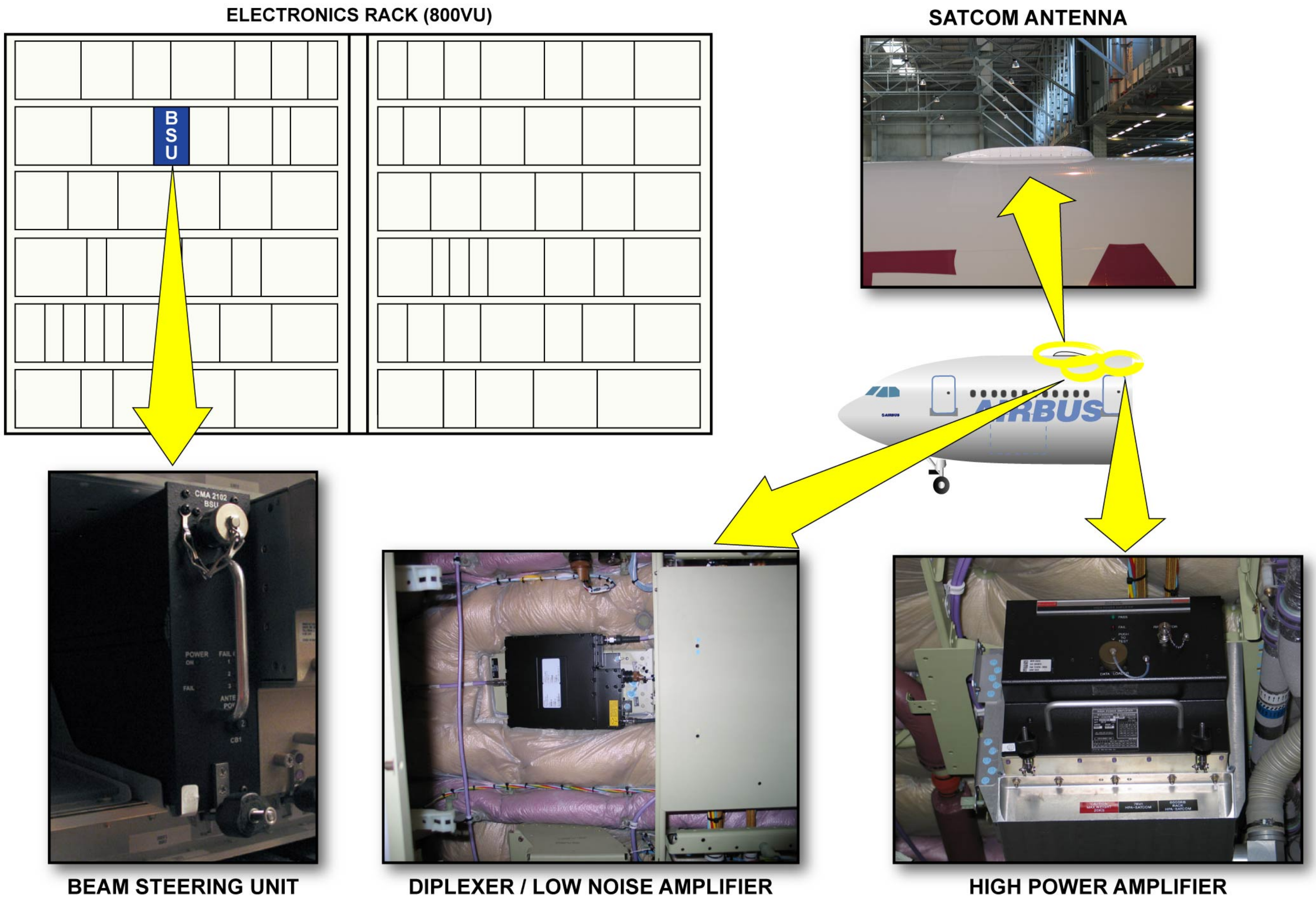
COCKPIT COMMUNICATIONS - COMPONENT LOCATION

G6B08031 - G10T4T0 - FM23P7000000001

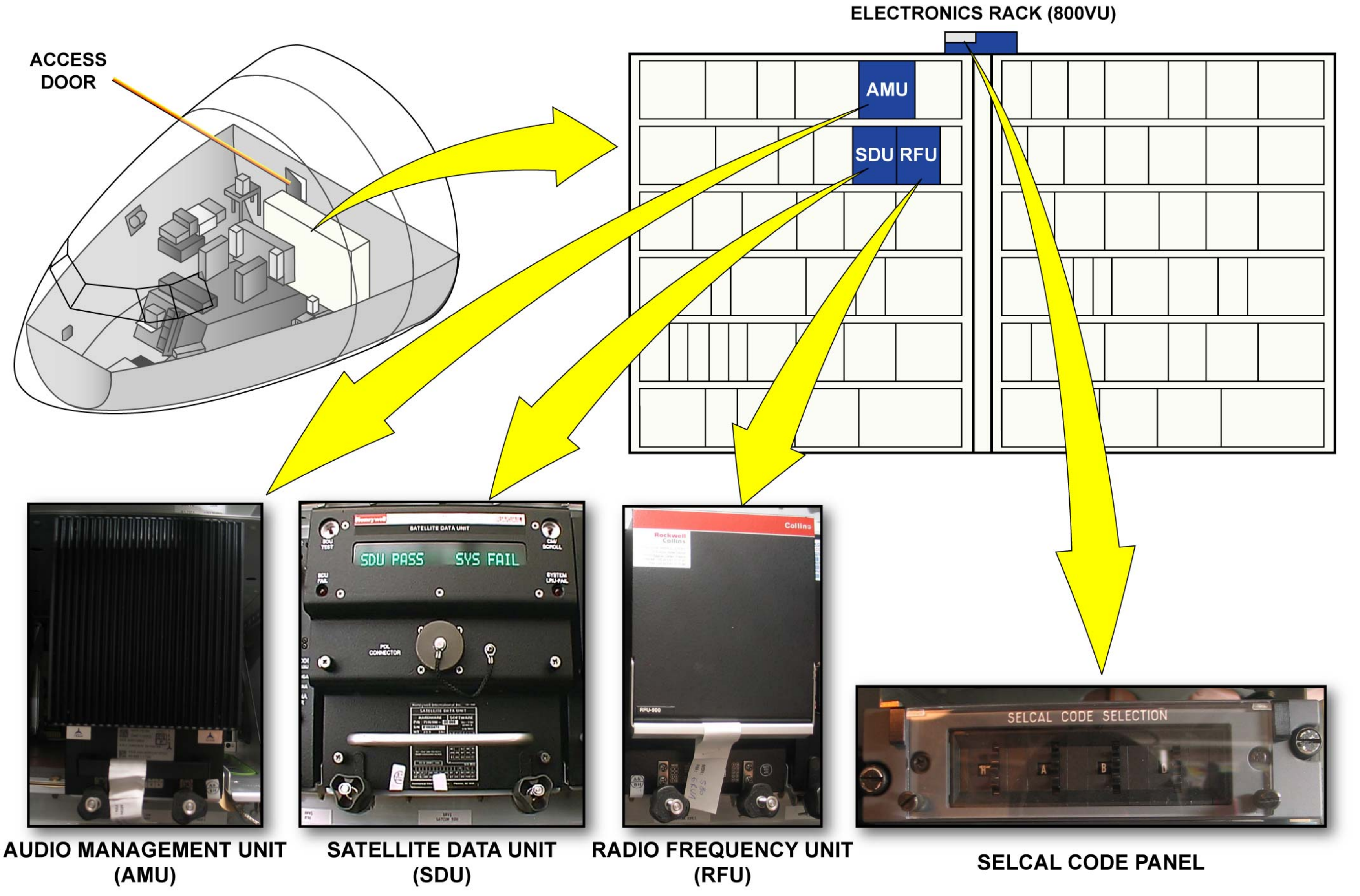


COCKPIT COMMUNICATIONS - COMPONENT LOCATION

G6B08031 - G10T4T0 - FM23P7000000001



COCKPIT COMMUNICATIONS - COMPONENT LOCATION

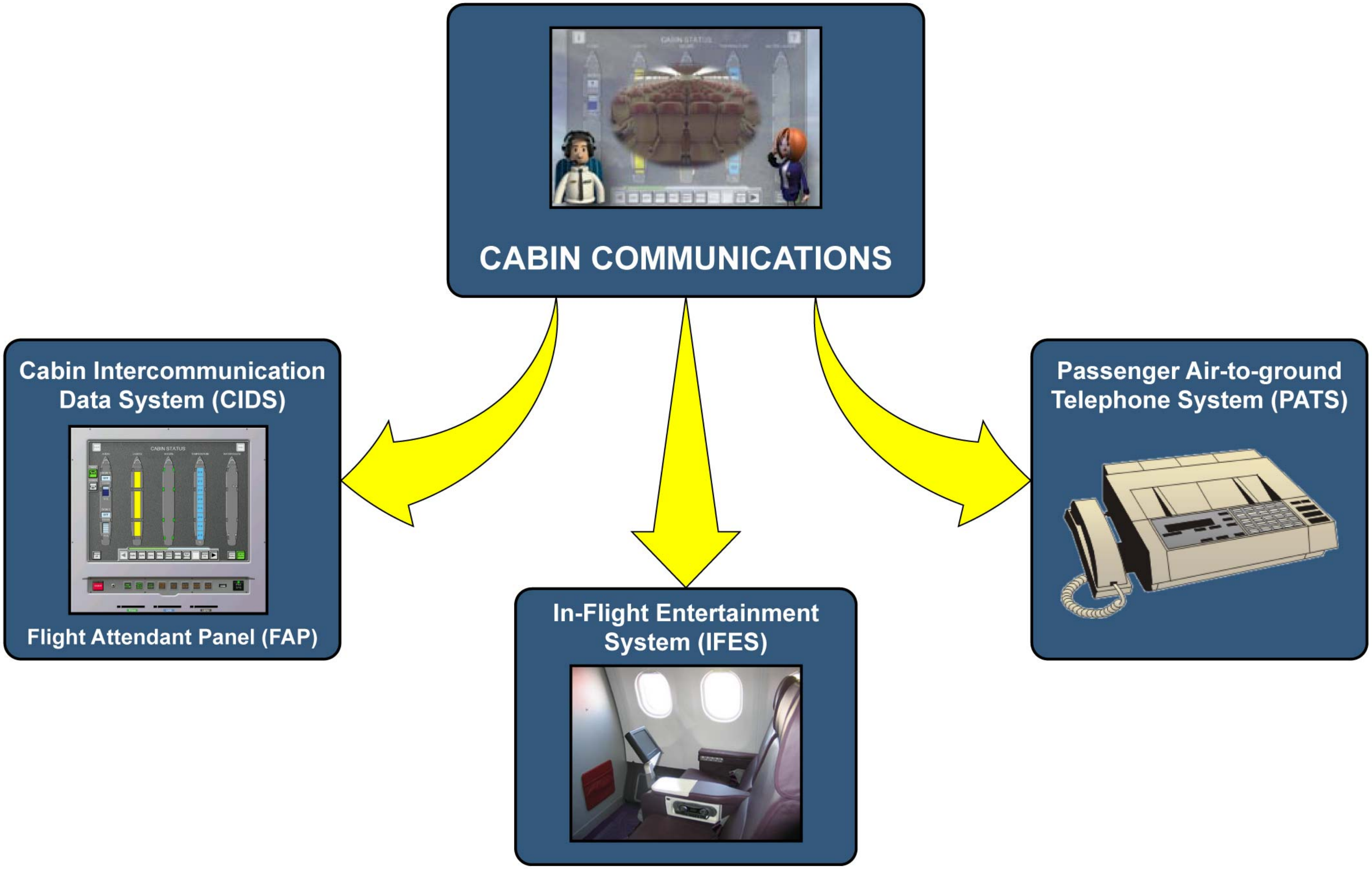


COCKPIT COMMUNICATIONS - COMPONENT LOCATION

23 COMMUNICATION SYSTEM PRESENTATION (1)

CABIN COMMUNICATIONS

The cabin communications system operates together with the Cabin Intercommunication Data System (CIDS), the In-Flight Entertainment System (IFES) and the PATS.

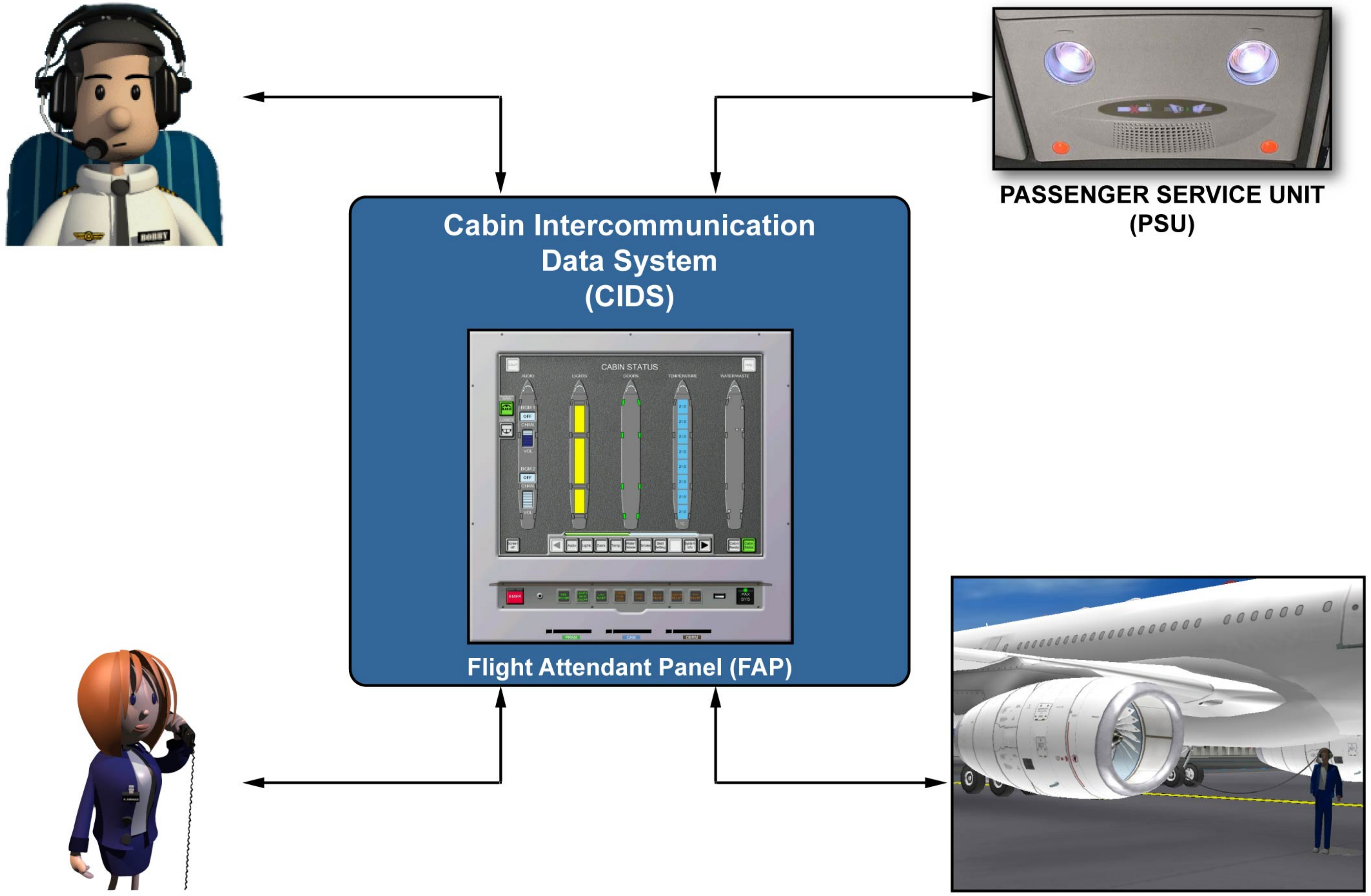


CABIN COMMUNICATIONS

23 COMMUNICATION SYSTEM PRESENTATION (1)

CIDS

The CIDS is the cabin core system. It is designed to interface between cabin crew, cockpit crew and passengers. It also manages maintenance related functions such as central cabin maintenance service, system programming features, configuration data loading and service interphone.



CIDS

G6B08031 - G10T4T0 - FM23P7000000001

23 COMMUNICATION SYSTEM PRESENTATION (1)

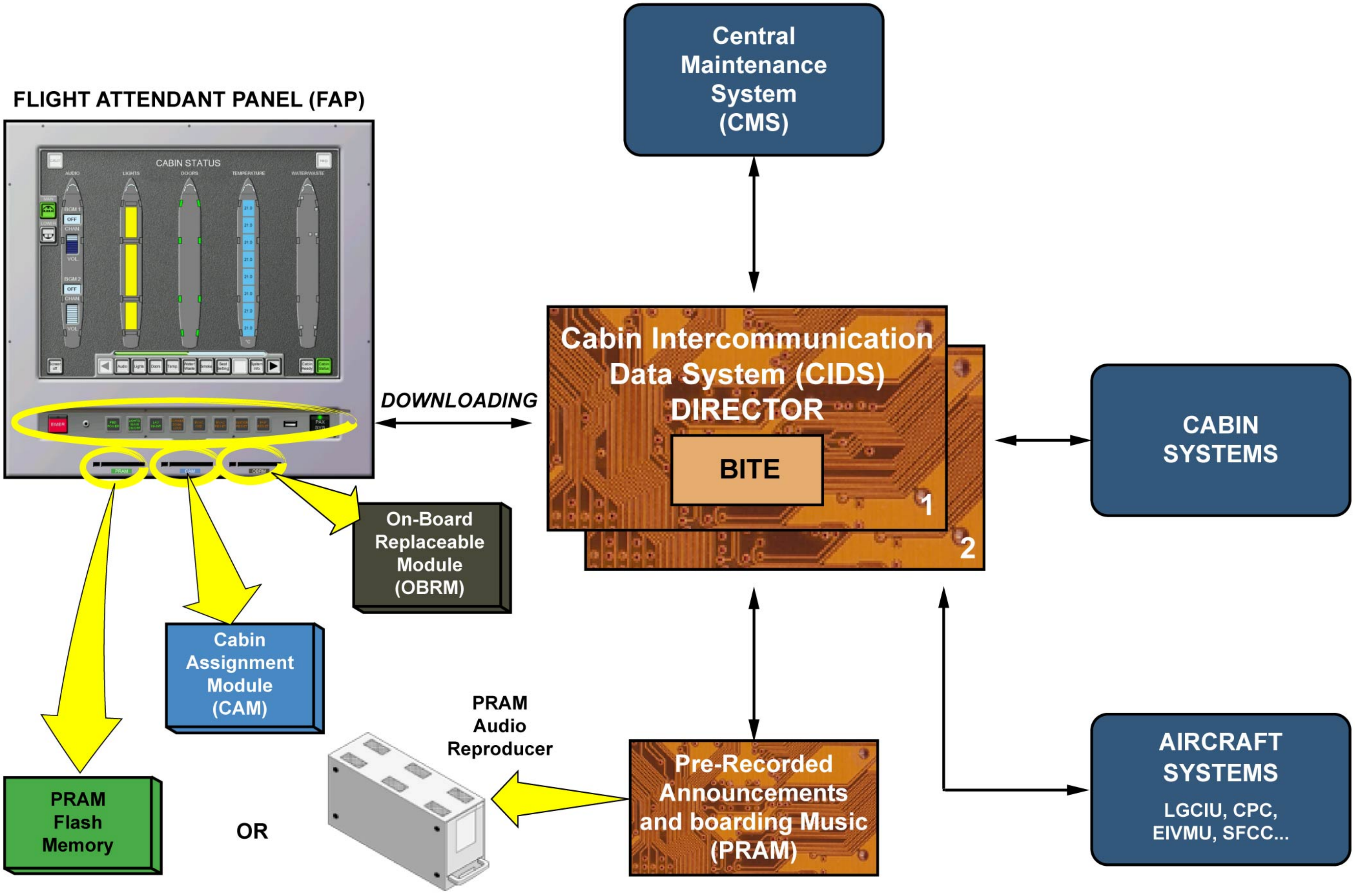
CIDS (continued)

FAP

The touch-screen of the Flight Attendant Panel (FAP) is the interactive interface between the CIDS and the cabin and maintenance crew members. Below the screen, there is a hard key panel for emergency operation in case of screen failure. The FAP is connected to the two CIDS DIRirectors (DIRs) through high-speed buses.

DIRECTORS

The two CIDS DIRs are fully identical and are wired in parallel. One actively controls the CIDS, the other one is in hot standby. The DIRs need to download the program and configuration to run correctly. The software is stored in a single On-Board Replaceable Module (OBRM), plugged into the front face of the FAP. Next to the OBRM, the Cabin Assignment Module (CAM) stores the system properties and the cabin layout configuration data. A Pre-Recorded Announcements and boarding Music (PRAM) sends pre-recorded announcements and boarding music to the DIRs to be broadcasted through the Passenger Address (PA) system. There are two types of PRAM, which have identical functions. It can be a flash memory type plugged into the FAP or an audio-tape reproducer installed in the avionics bay. The PRAM, whatever its type, is controlled from the FAP. The DIR will also use data from other aircraft systems. The DIRs are connected to cabin systems. Each DIR contains a dedicated BITE and is able to transfer the internal and external test results to the Central Maintenance System (CMS).



CIDS - FAP & DIRECTORS

23 COMMUNICATION SYSTEM PRESENTATION (1)

CIDS (continued)

PASSENGER FUNCTIONS

Top lines link the CIDS DIRs to type A Decoder/Encoder Units (DEUs) for passenger functions. The DEU A's are addressable units. The passenger functions are centralized in the Passenger Service Units (PSUs). The CIDS uses each DEU A to control cabin lighting, signs, calls and cabin audios according to cabin parameters programmed in the CAM.

CABIN CREW FUNCTIONS

Middle lines link the CIDS DIRs to type B DEUs related to crew and cabin system functions. Each DEU B has a specific address related to its location in the cabin zones. The Additional Attendant Panels (AAPs), located in flight crew stations, can control some cabin functions instead of the FAP. The Area Call Panels (ACPs), installed above the cabin aisles, give to the crew a visual indication of the system information such as lavatory smoke detection or passenger calls. The Attendant Indication Panels (AIPs), located in the cabin crew stations, indicate in written form passenger address, interphone and other system information, to the cabin crew.

PASSENGER ADDRESS SYSTEM

The PA system is one of the main functions of the CIDS. PA signals are broadcasted from the cockpit or cabin crew stations through all the cabin loudspeakers.

CABIN INTERPHONE SYSTEM

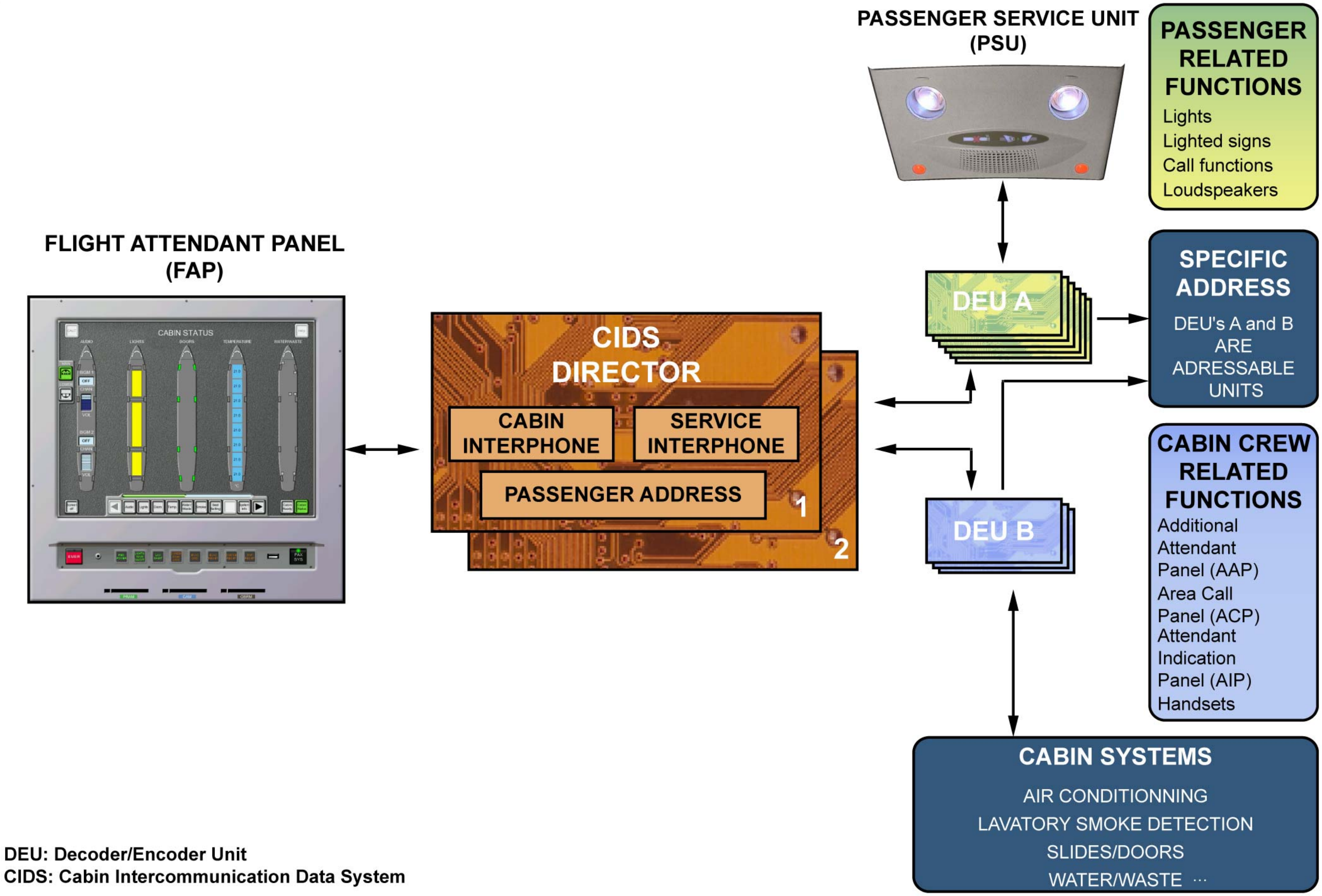
The cabin interphone system is used for the communication between all cabin crew stations via the cabin handsets. Each attendant station has a handset for passenger address and interphone functions.

SERVICE INTERPHONE SYSTEM

The service interphone system is used for voice communications, on ground only, between the service interphone jacks located around and in the aircraft.

CABIN SYSTEMS

For safety or passenger comfort functions, some systems like air conditioning, cabin lights, smoke detection, doors or water and waste systems, are connected to the CIDS DIRs. Interaction via the FAP is then possible following predefined procedures.



CIDS - PASSENGER FUNCTIONS ... CABIN SYSTEMS

23 COMMUNICATION SYSTEM PRESENTATION (1)

CIDS (continued)

COMPONENT LOCATION

The FAP is located at the purser station.

NOTE: A second FAP can be installed at door 4 to improve the redundancy and the cabin operations in the aft part of the cabin.

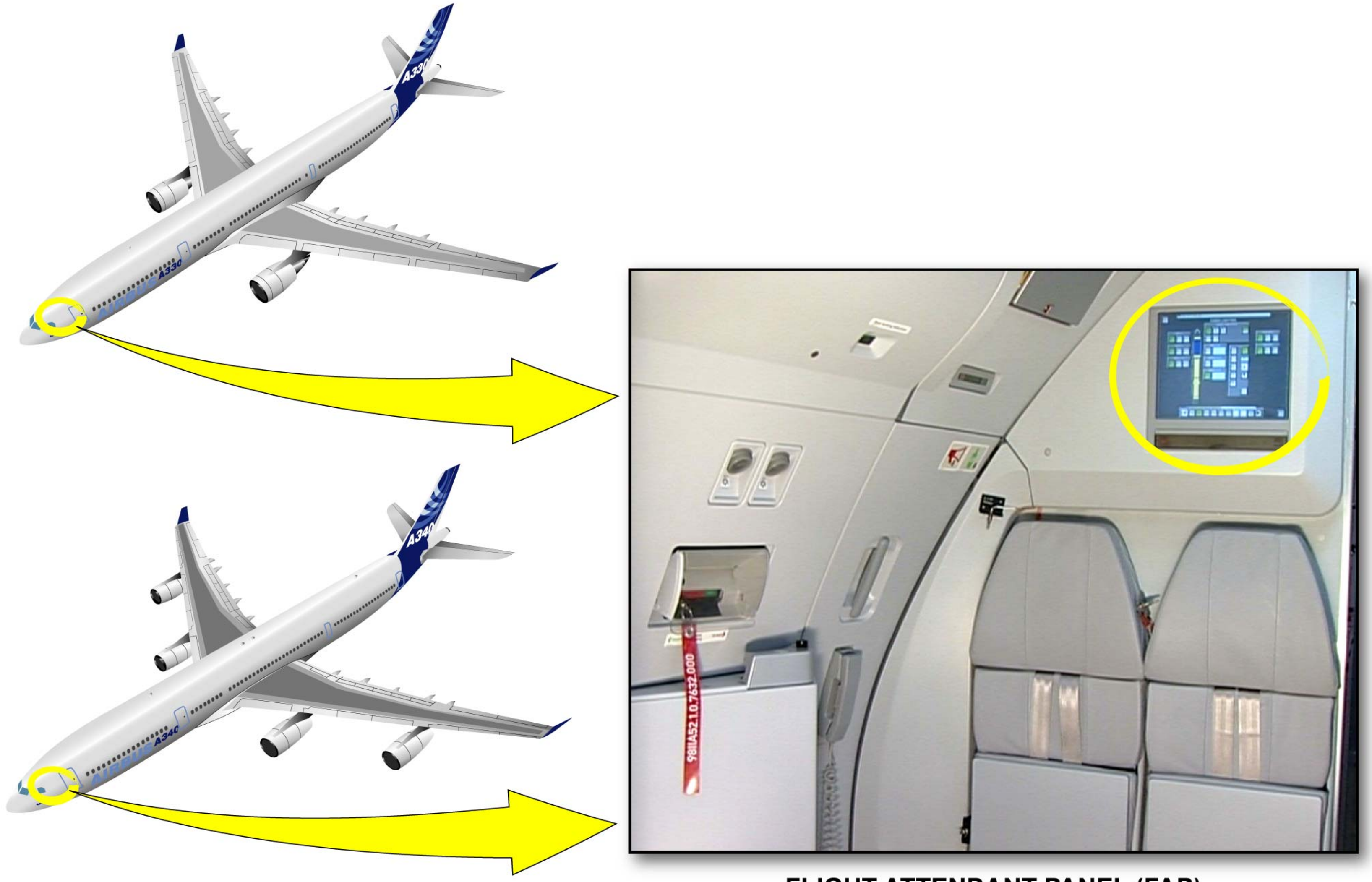
Each crew station has:
- a handset,
- an AAP,
- an AIP.

The ACPs, installed in the cabin ceiling near the attendant station, indicate:
- crew calls (pink steady or flashing),
- passenger call (blue steady),
- lavatory call (amber steady),
- lavatory smoke detection (amber flashing).

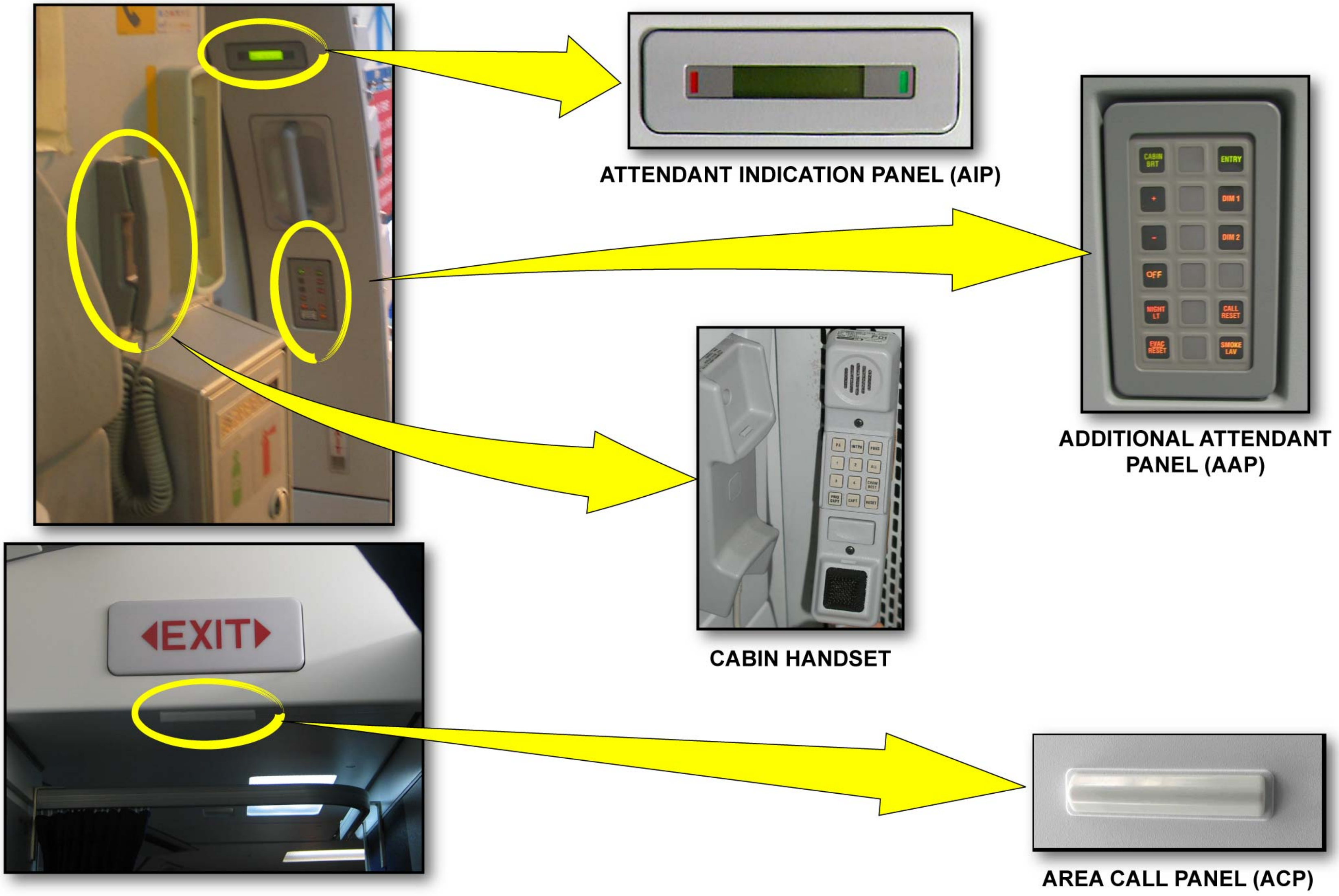
To call the cabin crew from the cockpit, the overhead CALLS panel is used. A cockpit handset is located on the pedestal and is used for a direct passenger address. An optional keyboard on the cockpit handset is used for communication between the cockpit and the cabin and/or the service interphones.
The DEUs type A and B are located behind the cabin ceiling panels. The number of DEUs installed depends on fuselage length and the cabin configuration.

NOTE: The distance between the mounting quick release latches is not the same on the DEU A mount and the DEU B mount. Therefore they are not interchangeable.

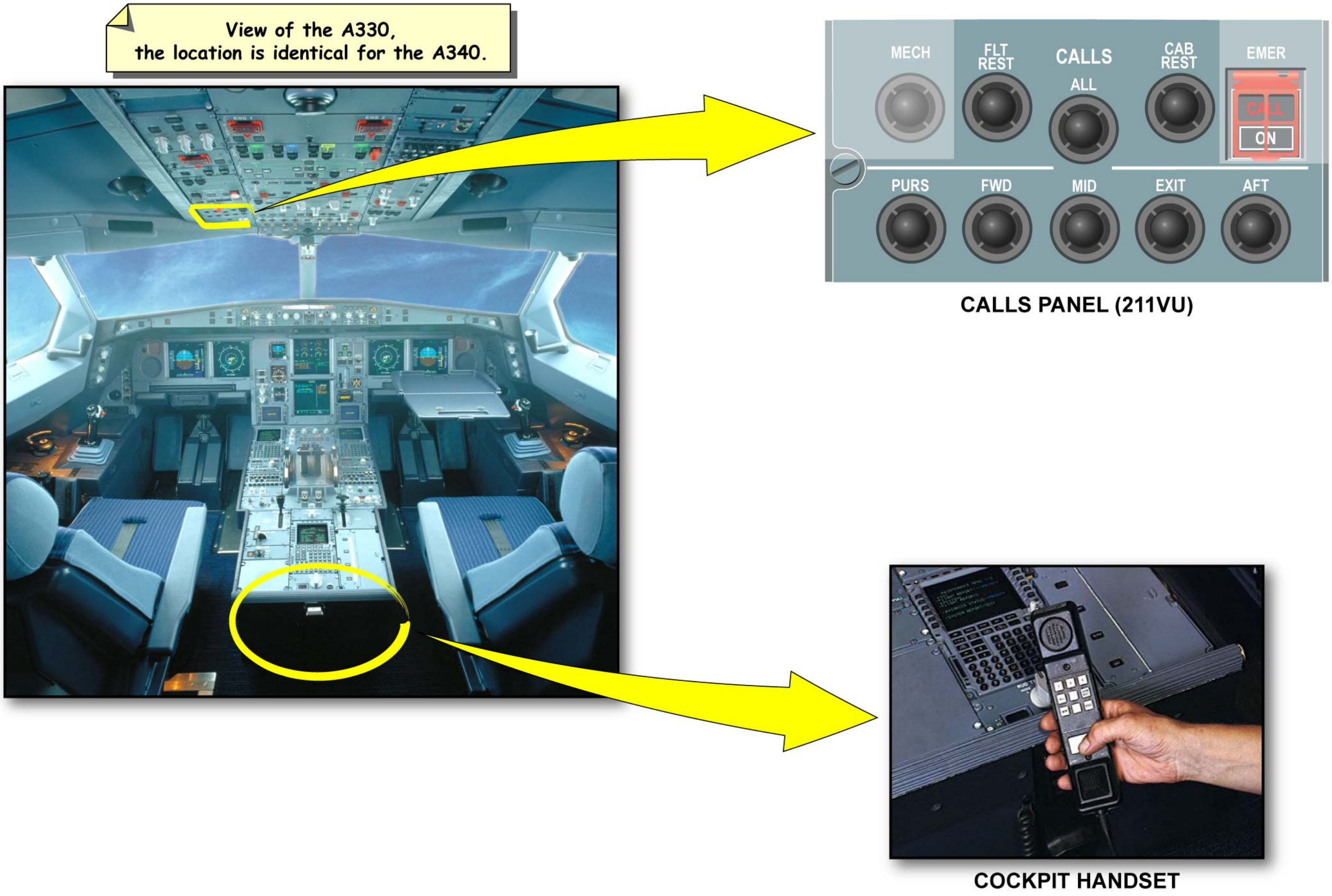
The main components of the CIDS are the DIRectors (DIRs).



CIDS - COMPONENT LOCATION



CIDS - COMPONENT LOCATION



CIDS - COMPONENT LOCATION

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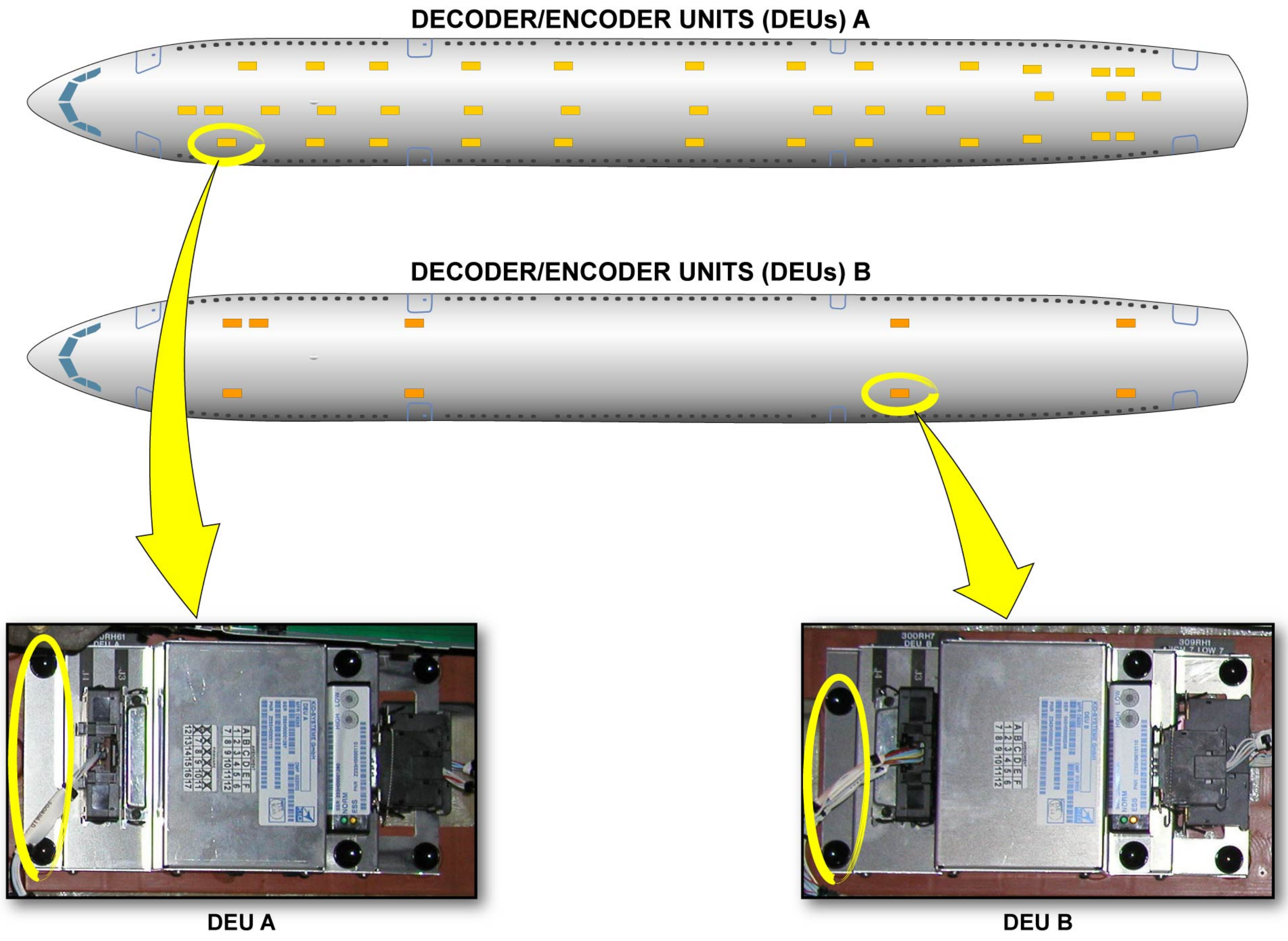
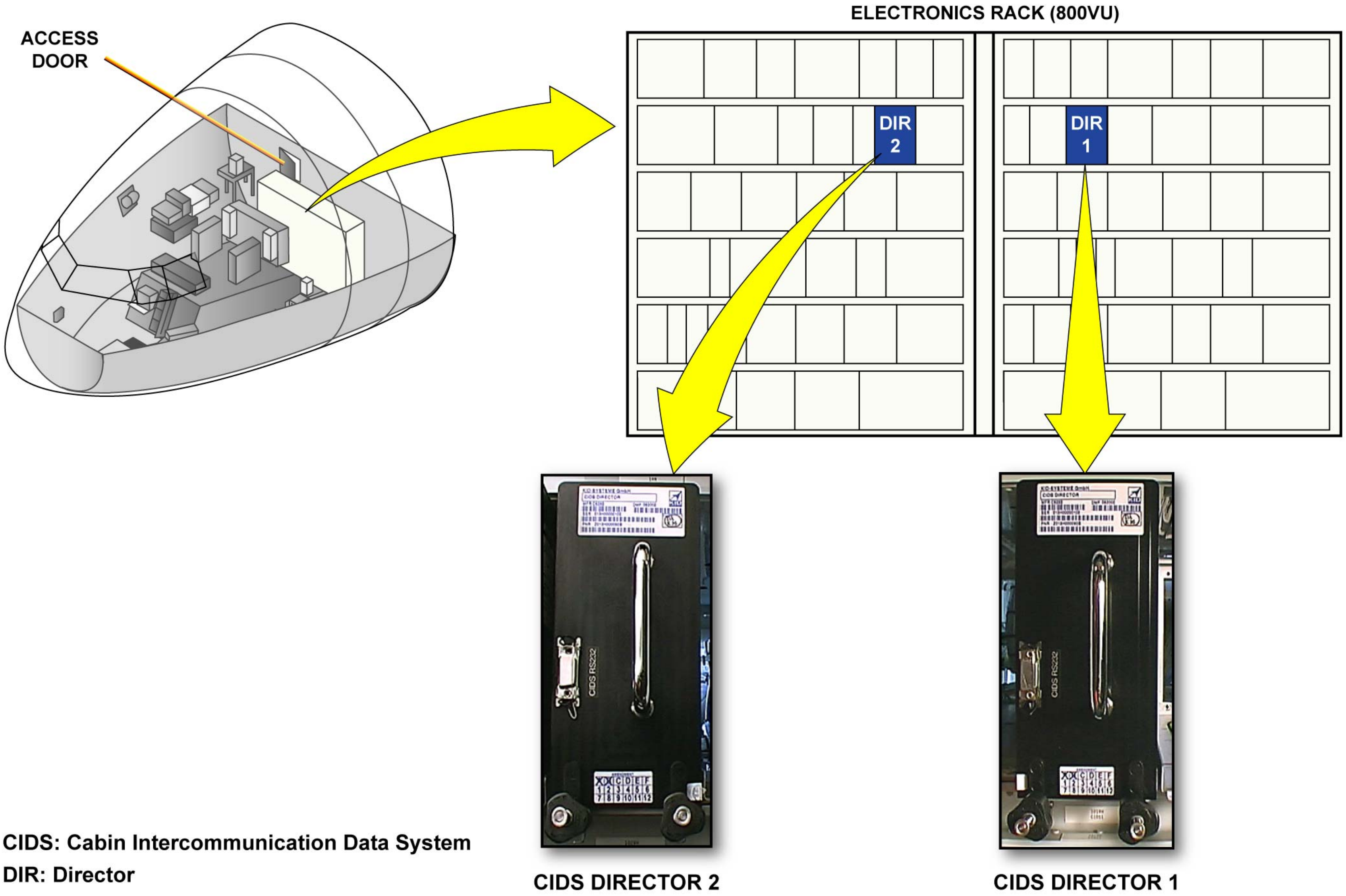


CIDS - COMPONENT LOCATION



CIDS - COMPONENT LOCATION

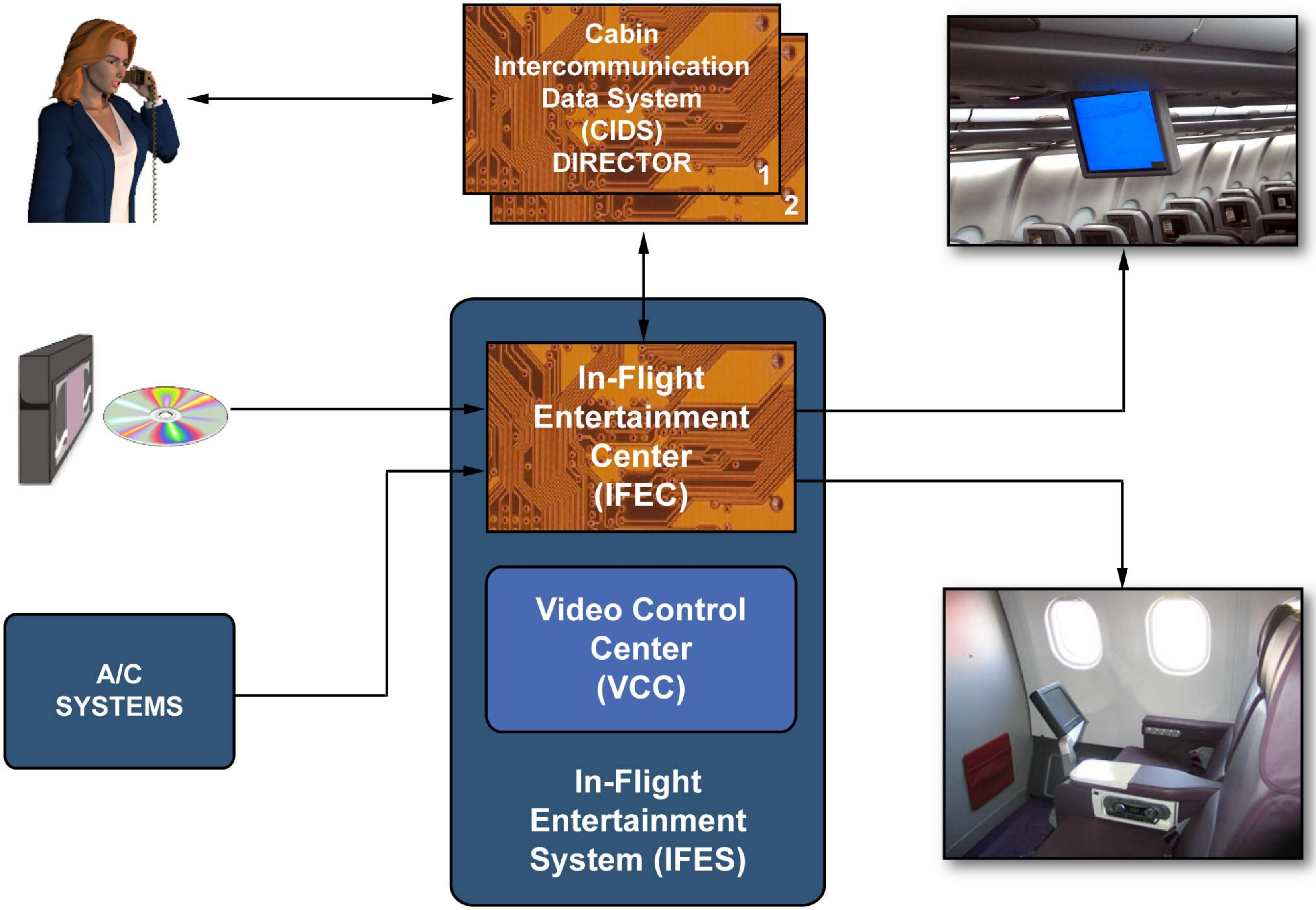
G6B08031 - G10T4T0 - FM23P7000000001

23 COMMUNICATION SYSTEM PRESENTATION (1)

IFES

GENERAL

The IFES gives audio and video programs to passengers. It can also give flight information and interactive utilities.



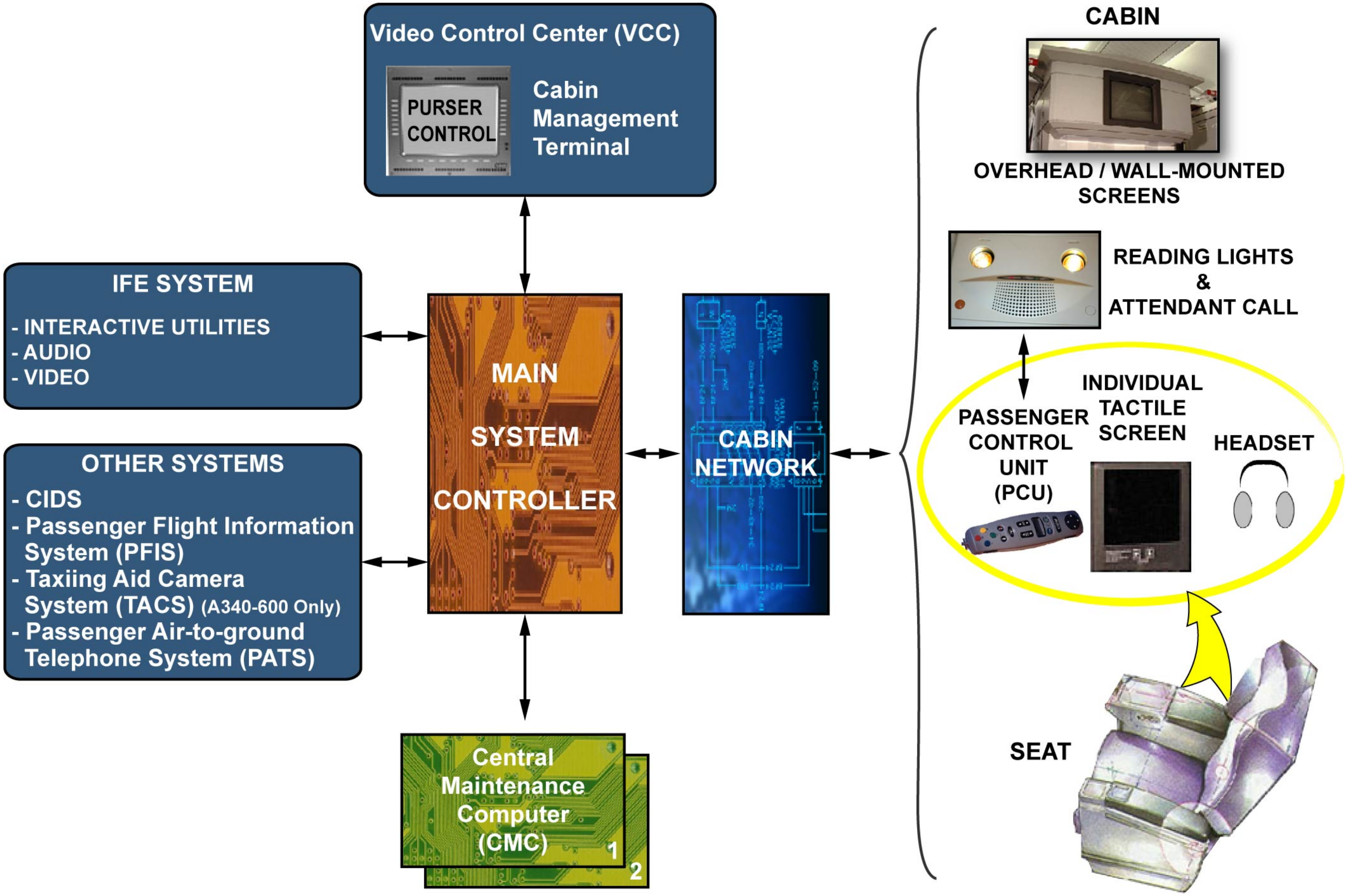
IFES - GENERAL

23 COMMUNICATION SYSTEM PRESENTATION (1)

IFES (continued)

OVERVIEW

The Purser Control is connected to the main system controller. The main system controller makes the interface between the core system and the passengers. It will manage cabin crew and passenger requests and answers as well as interaction with other systems. The distribution is done through a cabin network to the passenger environment. The passengers use the Passenger Control Unit (PCU) to select the channel and the volume of the audio and video programs. It is also used to control the reading lights and to call the cabin attendant. Videos are broadcasted in the cabin on overhead LED screens. Tactile LED screens can be installed on the armrest of the seat or the back of the seat in front. They are used with the PCU to control interactive utilities. Passengers can access audio, video, interactive games and the web from their seats. This is offered via a menu displayed on the tactile screens and available immediately after IFE system power-up. In-seat telephone facilities can be installed in the cabin. The IFES is connected to the PATS. The PCU is then used as a telephone handset.



IFES - OVERVIEW

23 COMMUNICATION SYSTEM PRESENTATION (1)

IFES (continued)

CONTROL AND INDICATING

The Purser Control, located on the Video Control Center (VCC) in the cabin, gives the central control point for the system.

VIDEO CONTROL CENTER (VCC)

PURSER CONTROL

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IFES - CONTROL AND INDICATING

23 COMMUNICATION SYSTEM PRESENTATION (1)

IFES (continued)

COMPONENT LOCATION

The Passenger Entertainment System (PES) video shows pre-recorded video programs through different display units in the passenger compartment. The PES video also shows pre-recorded video programs through seat display units via the Digital Seat Electronic Boxes (DSEB).
Processing components and audio and video source providers are located on the In-Flight Entertainment (IFE) rack in the avionics bay or the VCC located in the cabin.

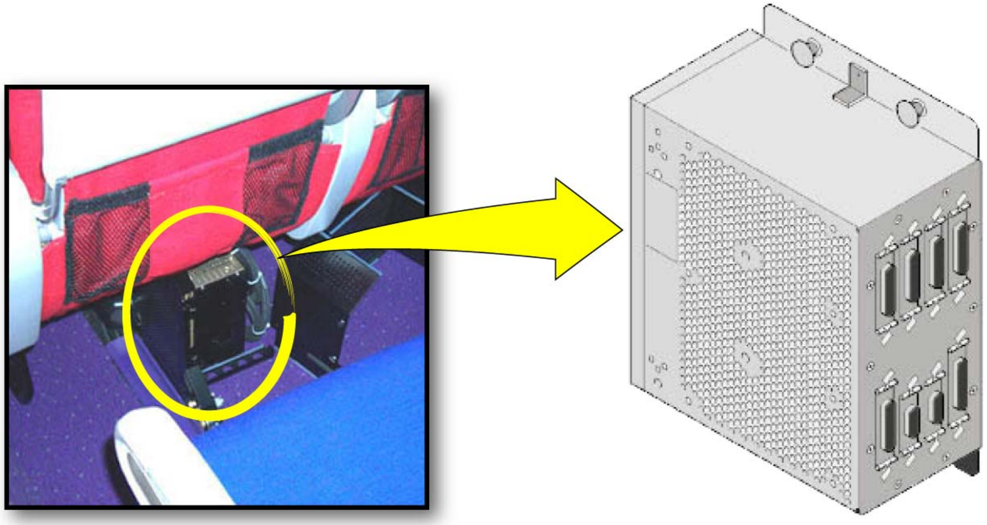
SEAT DISPLAY UNIT (BUSINESS CLASS)

OVERHEAD/WALL-MOUNTED SCREEN

OVERHEAD LCD SCREEN

PASSENGER CONTROL UNIT (PCU)

SEAT DISPLAY UNIT (ECONOMY CLASS)



DIGITAL SEAT ELECTRONIC BOX (DSEB)

IFES - COMPONENT LOCATION

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IN-FLIGHT ENTERTAINMENT CENTER (IFEC)

IFES - COMPONENT LOCATION

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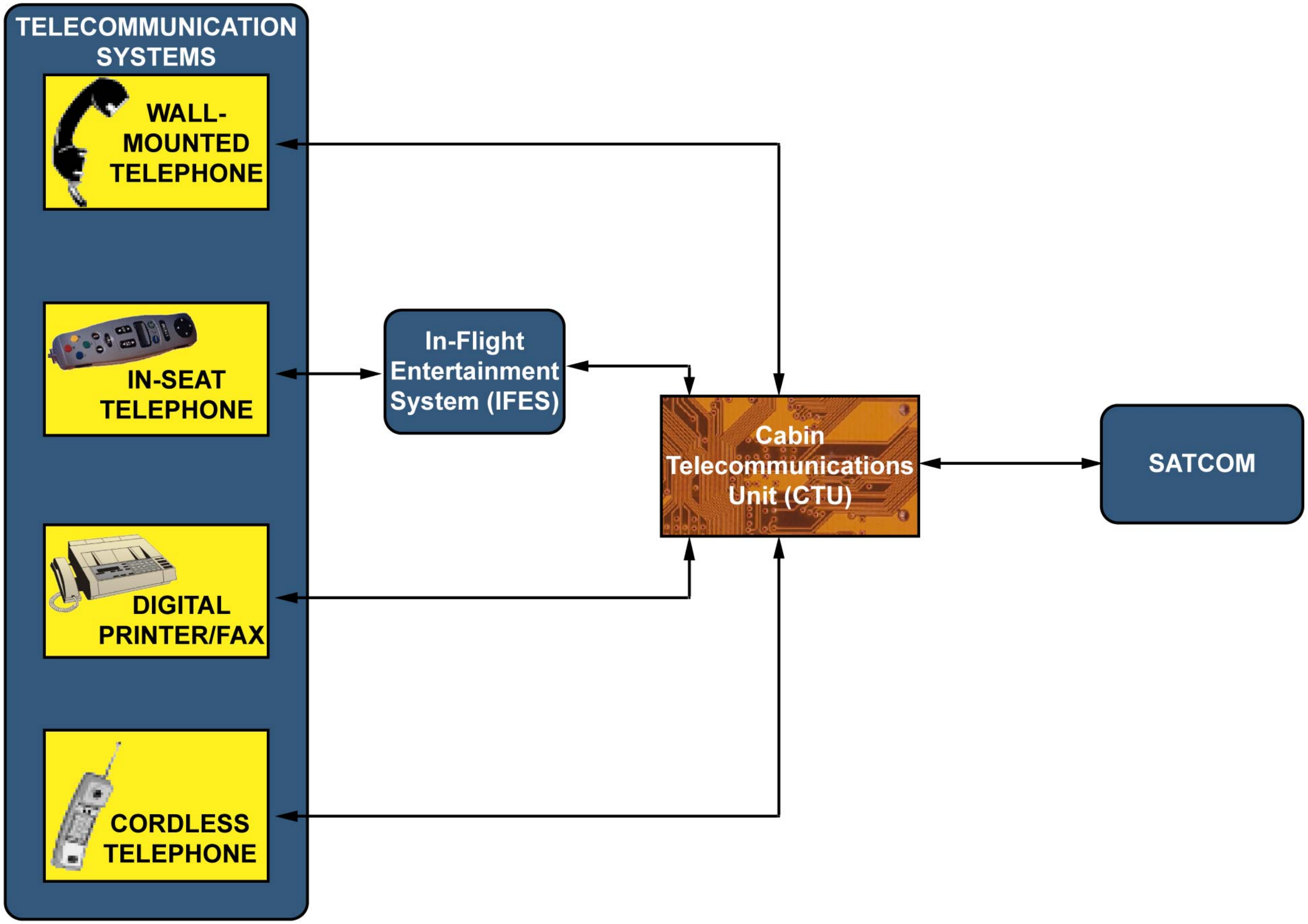
23 COMMUNICATION SYSTEM PRESENTATION (1)

PATS

GENERAL

The main component of the Passenger Air-to-Ground Telephone System (PATS) is the Cabin Telecommunications Unit (CTU). It is installed in the avionics compartment. It gives telephone and data transmission capabilities to the cabin. The aircraft can have different telecommunication systems:
- wall-mounted telephone,
- in-seat telephone,
- digital printer/FAX machine,
- cordless telephone.

Communication is achieved, directly or via the IFES, through the CTU, which transmits communications to the SATCOM.



PATS - GENERAL

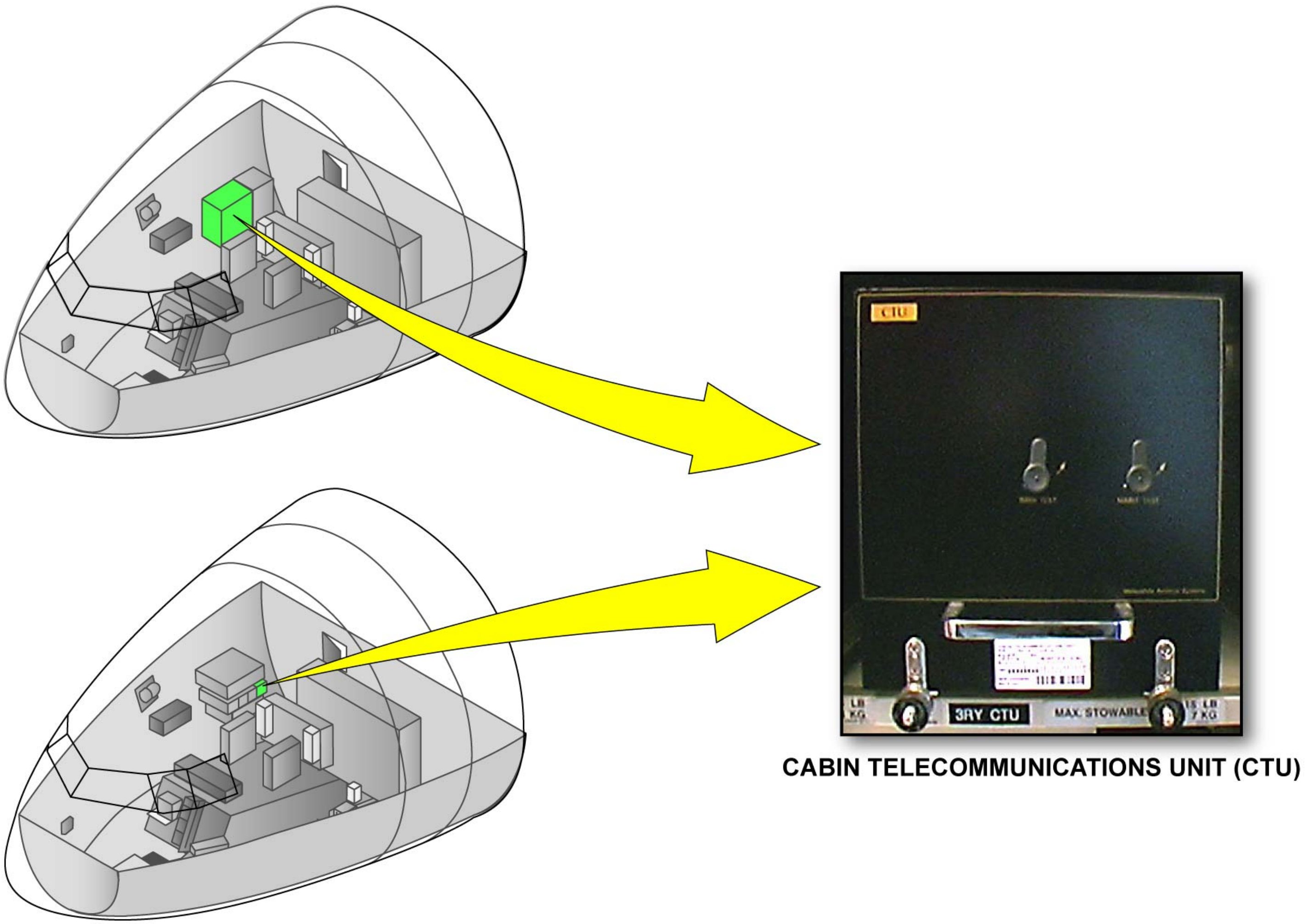
G6B08031 - G10T4T0 - FM23P7000000001

23 COMMUNICATION SYSTEM PRESENTATION (1)

PATS (continued)

COMPONENT LOCATION

Depending on the aircraft version, the CTU is located in the IFEC or on a specific rack in the avionics bay.



PATS - COMPONENT LOCATION

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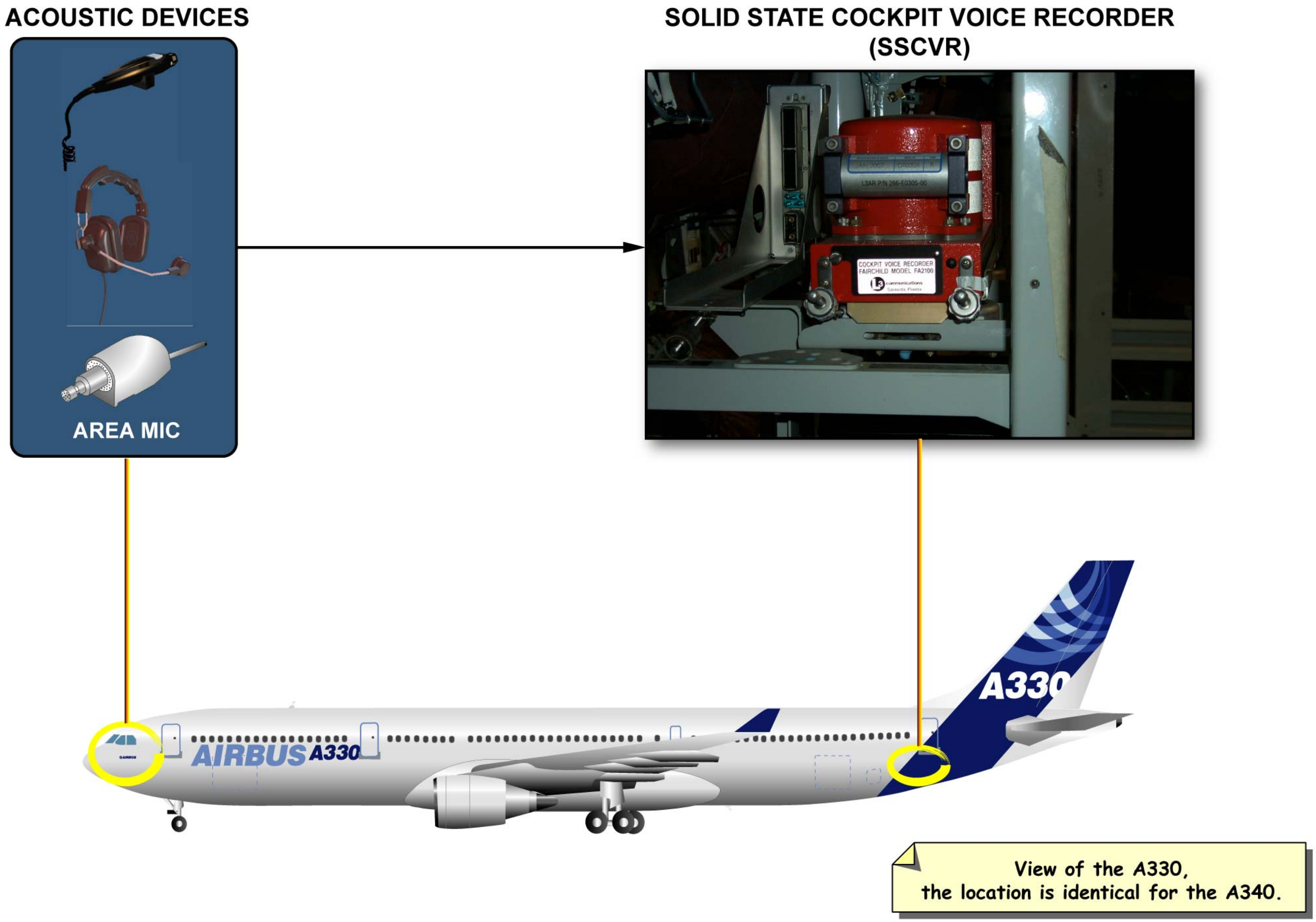
23 COMMUNICATION SYSTEM PRESENTATION (1)

SSCVR

GENERAL

The Solid State Cockpit Voice Recorder (SSCVR) records in-flight and on-ground conversations and radio communications in solid-state memories.



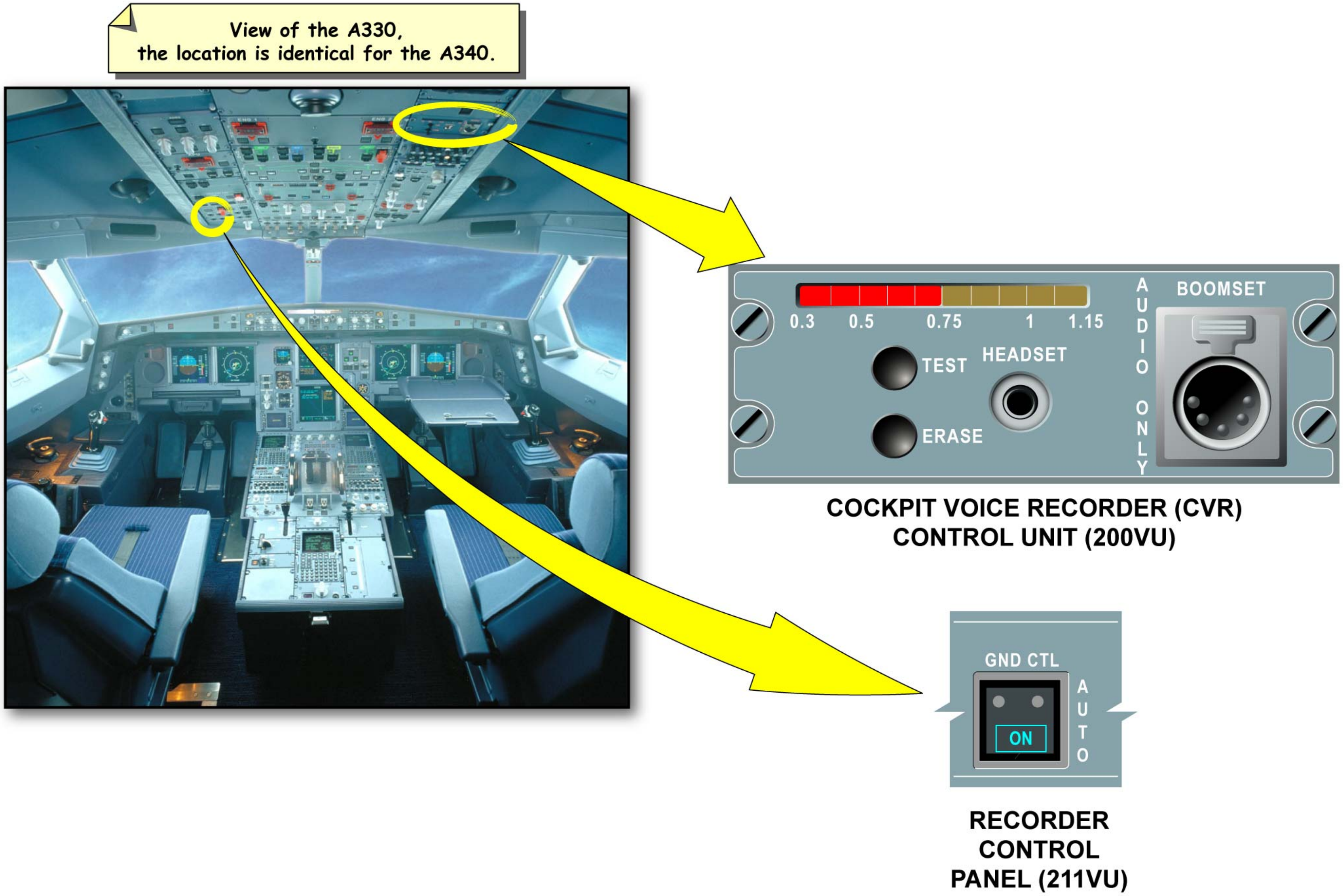
SSCVR - GENERAL

23 COMMUNICATION SYSTEM PRESENTATION (1)

SSCVR (continued)

CONTROL AND INDICATING

For manual control on the ground, the Cockpit Voice Recorder (CVR) has to be energized by pressing the ReCorDeR GrouND ConTroL P/BSW. The front face of the CVR control unit features a test P/B.



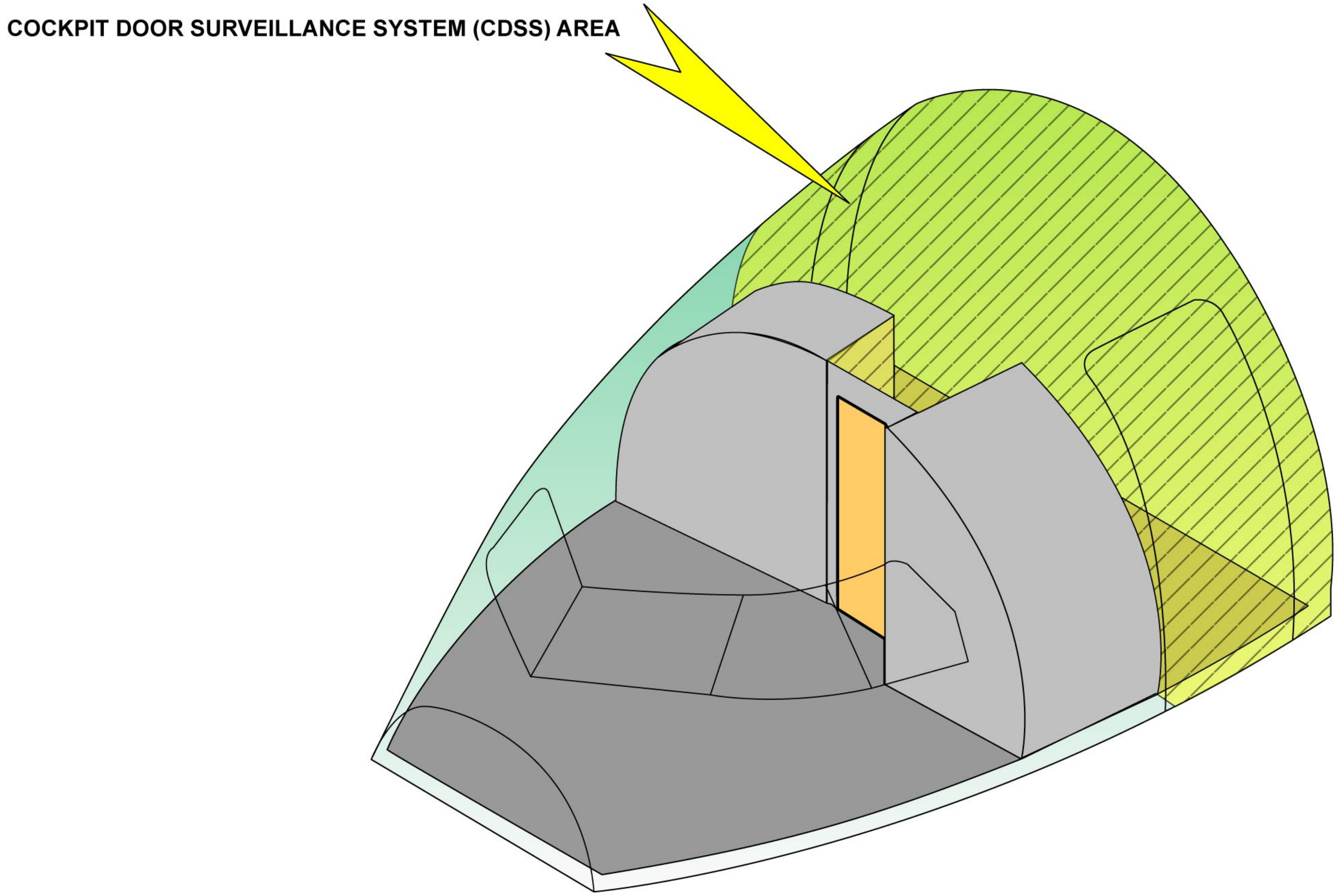
SSCVR - CONTROL AND INDICATING

23 COMMUNICATION SYSTEM PRESENTATION (1)

CDSS

GENERAL

The Cockpit Door Surveillance System (CDSS) is related to the Cockpit Door Locking System (CDLS) and uses cameras in the cockpit entrance and in the left and right door 1 areas. The cameras let the flight crew monitor the door 1 area and identify persons who request access to the cockpit.



CDSS - GENERAL

G6B08031 - G10T4T0 - FM23P7000000001

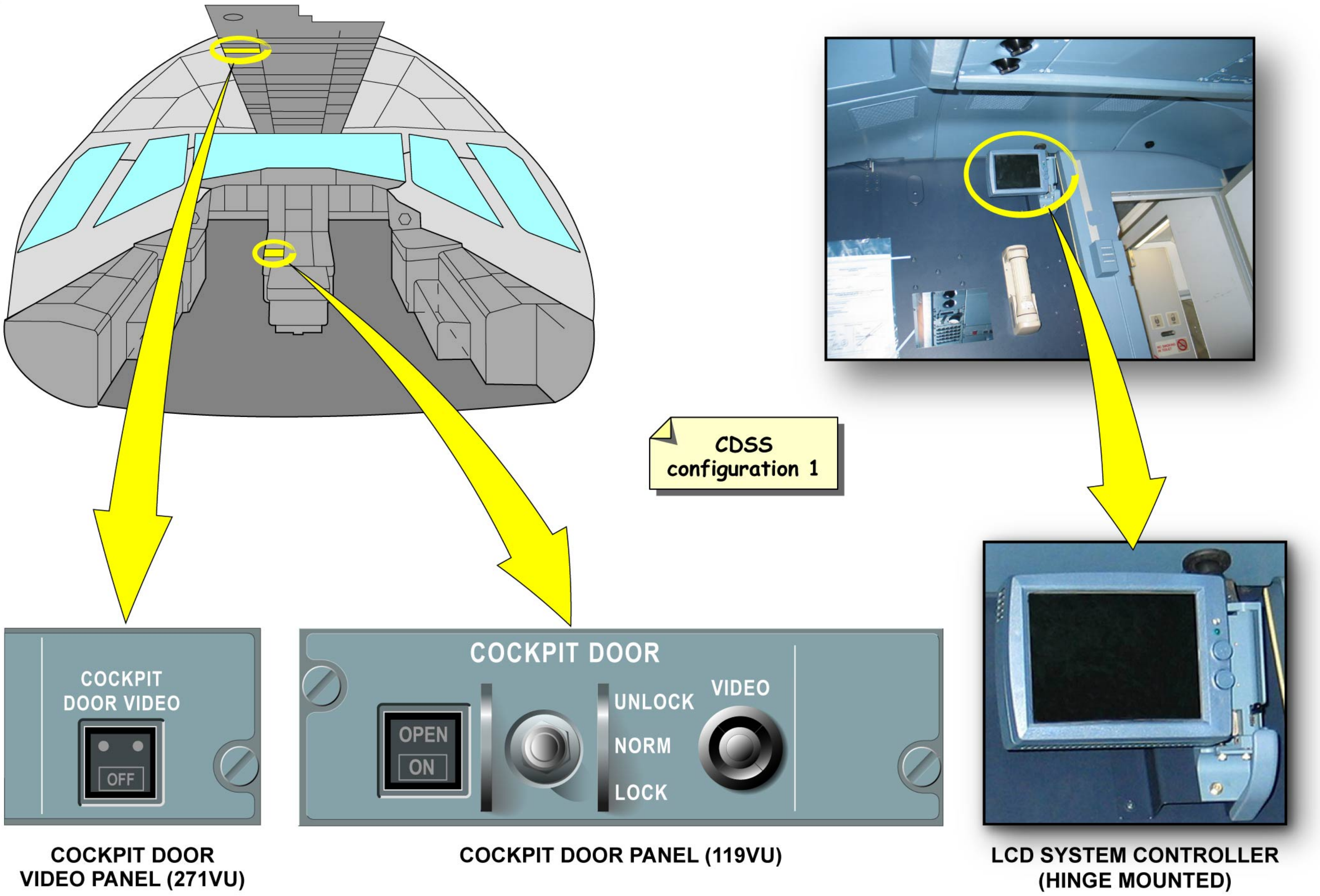
23 COMMUNICATION SYSTEM PRESENTATION (1)

CDSS (continued)

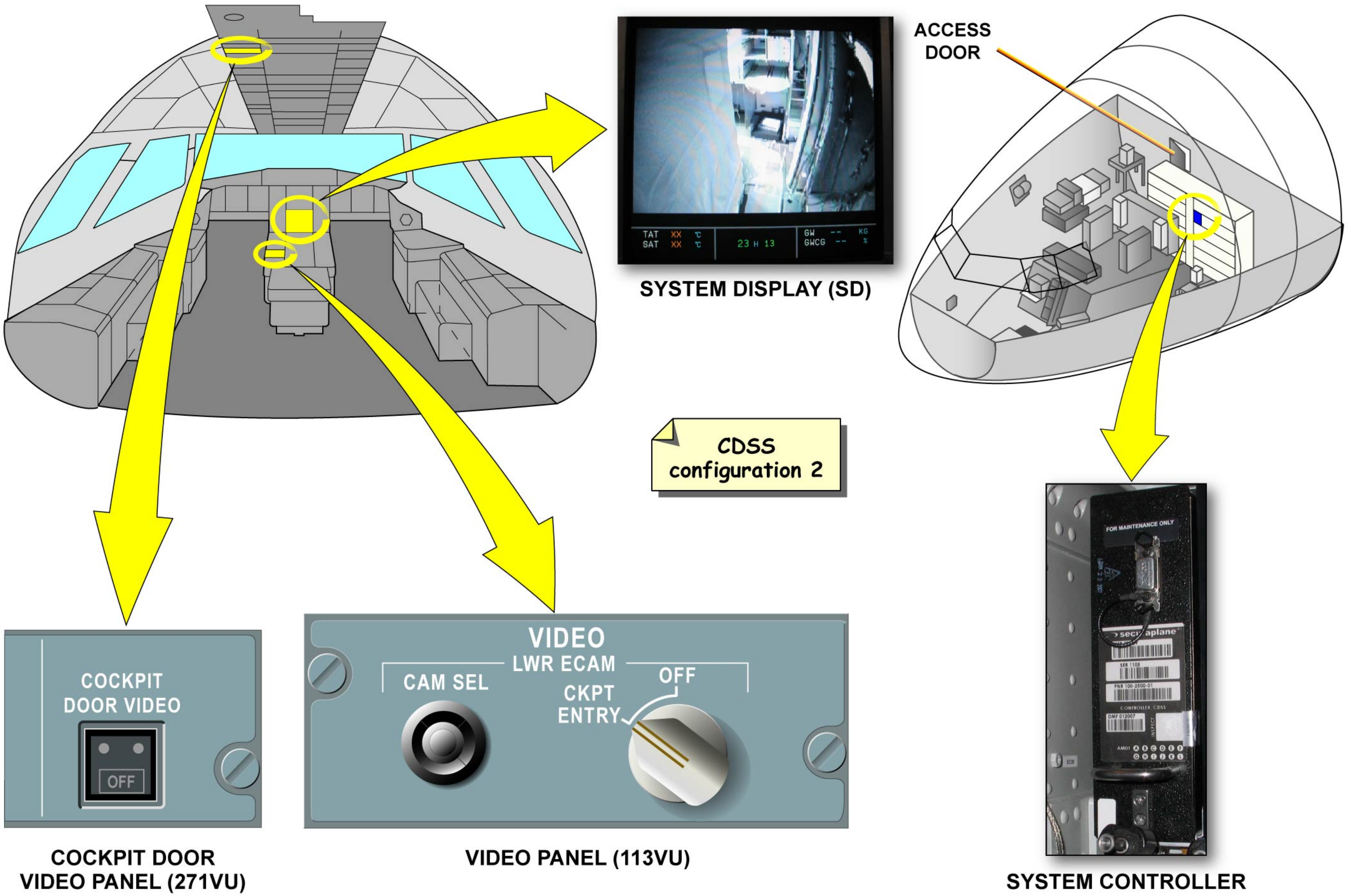
CONTROL AND INDICATING

According to your aircraft configuration, the CDSS has either:
- 1 LCD mounted on the rear cockpit wall, with a system controller,
- 1 CocKPiT DOOR VIDEO P/B installed on the overhead panel,
- 1 VIDEO P/B installed on the pedestal, and,
- 1 CDSS "IN USE" indication light, installed above the FAP on the left door 1 area,

or:
- 1 CKPT DOOR VIDEO P/B installed on the overhead panel,
- 1 CAMera SELection P/B,
- 1 CKPT ENTRY rotary switch installed on the pedestal, and,
- 1 system controller, installed in the avionics bay, to process and display images on the lower ECAM Display Unit (SD).



CDSS - CONTROL AND INDICATING



CDSS - CONTROL AND INDICATING

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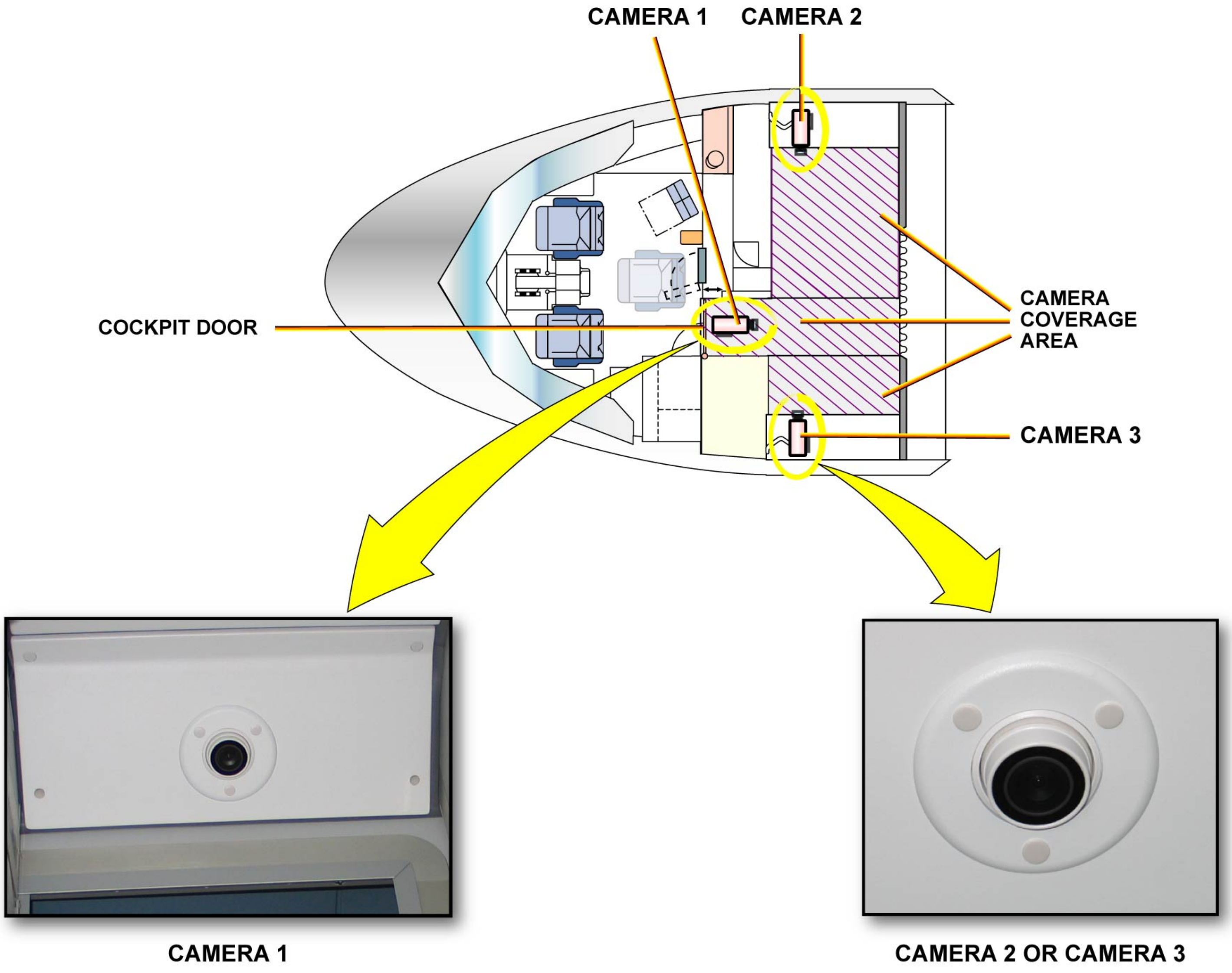
23 COMMUNICATION SYSTEM PRESENTATION (1)

CDSS (continued)

COMPONENT LOCATION

Three cameras are installed in the ceiling panels in the cockpit entrance and the door 1 area.



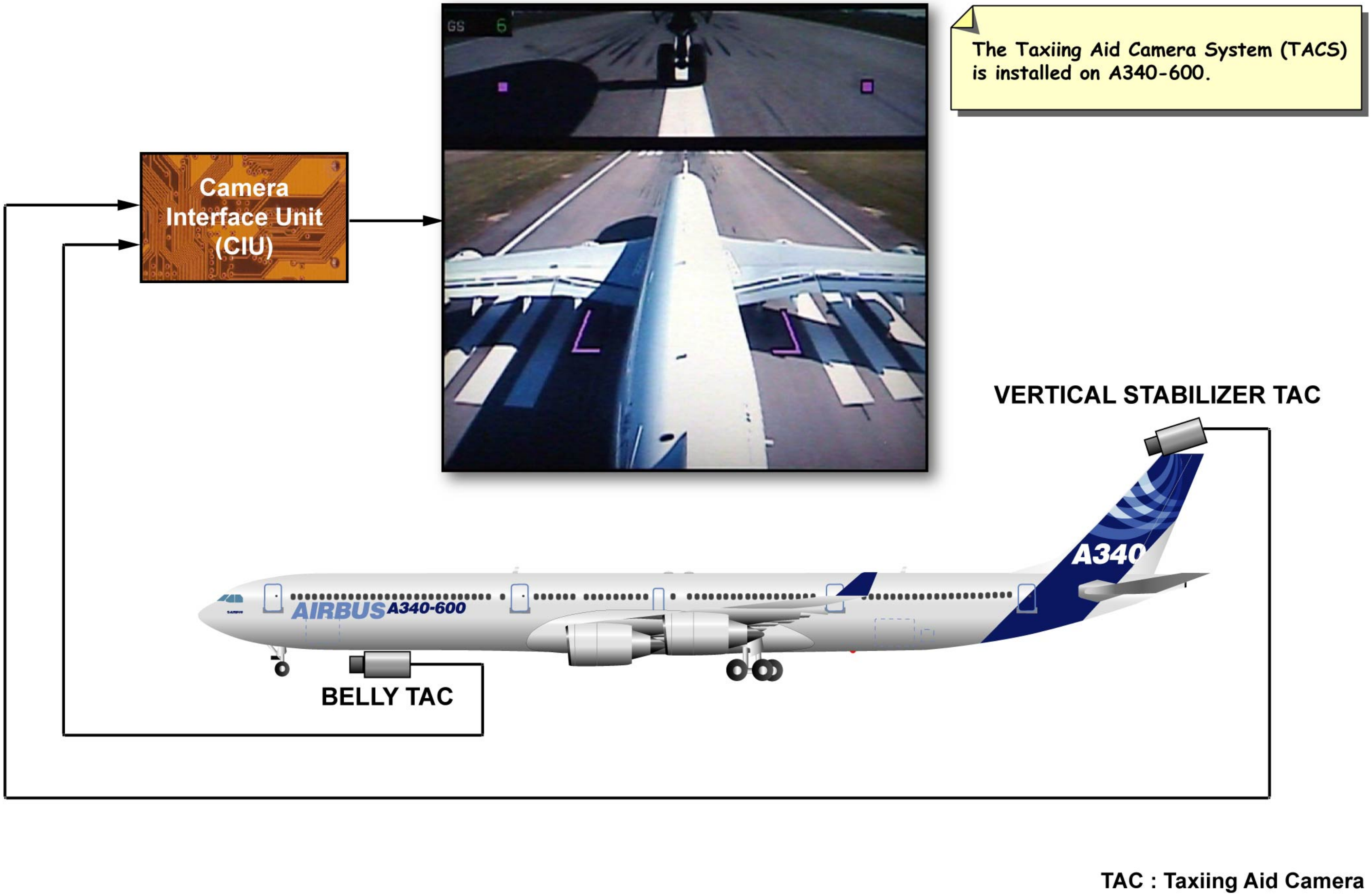
CDSS - COMPONENT LOCATION

23 COMMUNICATION SYSTEM PRESENTATION (1)

TACS (A340-600)

GENERAL

The TACS is an aid to the crew during taxiing of the A/C. It lets the crew visually monitor the position of the L/G wheels on the taxiway. The main components of this system are the 2 Taxiing Aid Cameras (TACs) and the Camera Interface Unit (CIU).



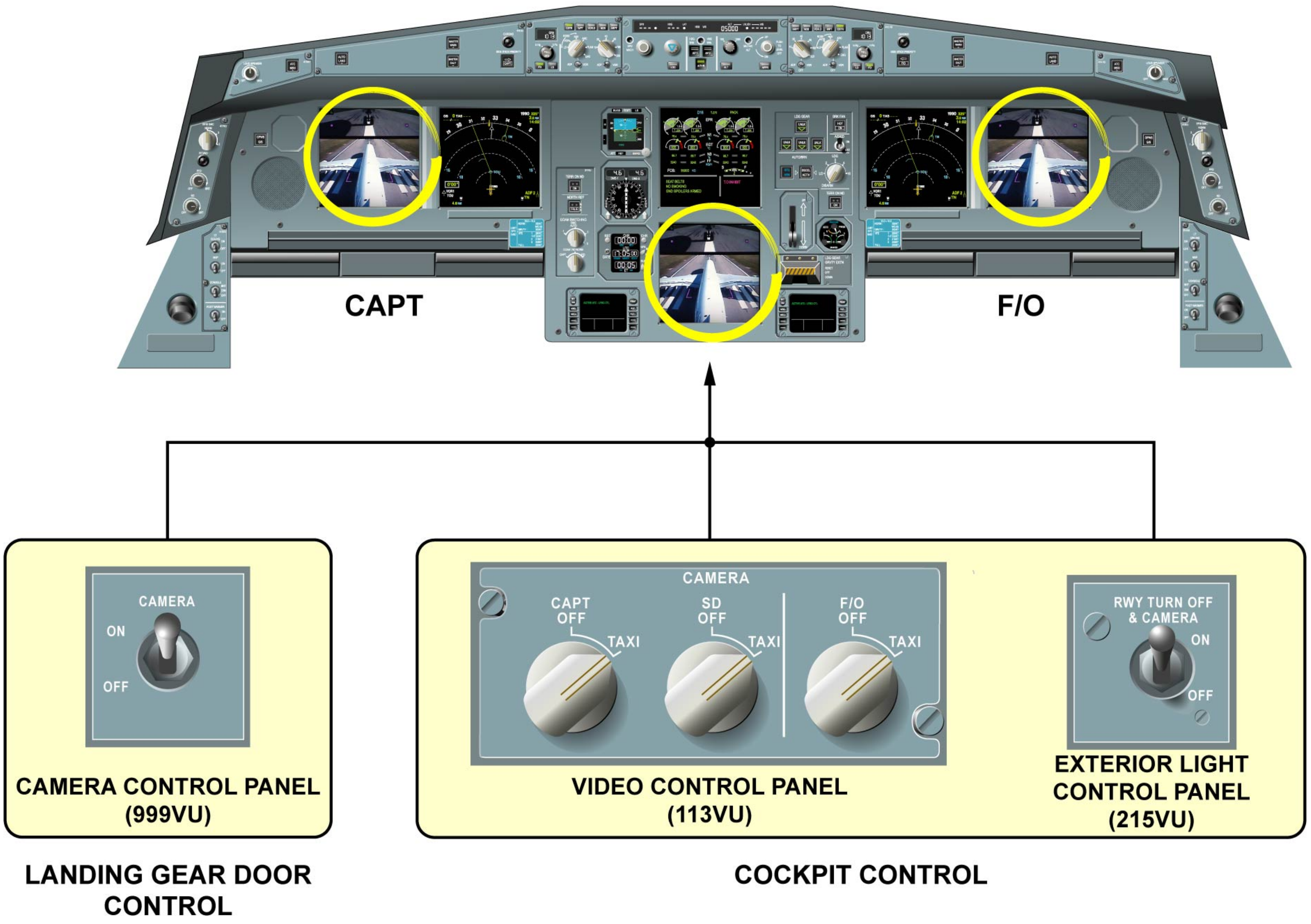
TACS (A340-600) - GENERAL

23 COMMUNICATION SYSTEM PRESENTATION (1)

TACS (A340-600) (continued)

CONTROL AND INDICATING

The CAMERA control panel is used to select the DU for display of the video images from the cameras. A CAMERA switch is located on the LDG door GND opening panel to inhibit the display of the video images. A RunWaY TURN OFF & CAMERA switch is located on the pedestal. The TACS can operate by day and by night because lights are installed on the aircraft to bring light to the filmed areas.



TACS (A340-600) - CONTROL AND INDICATING

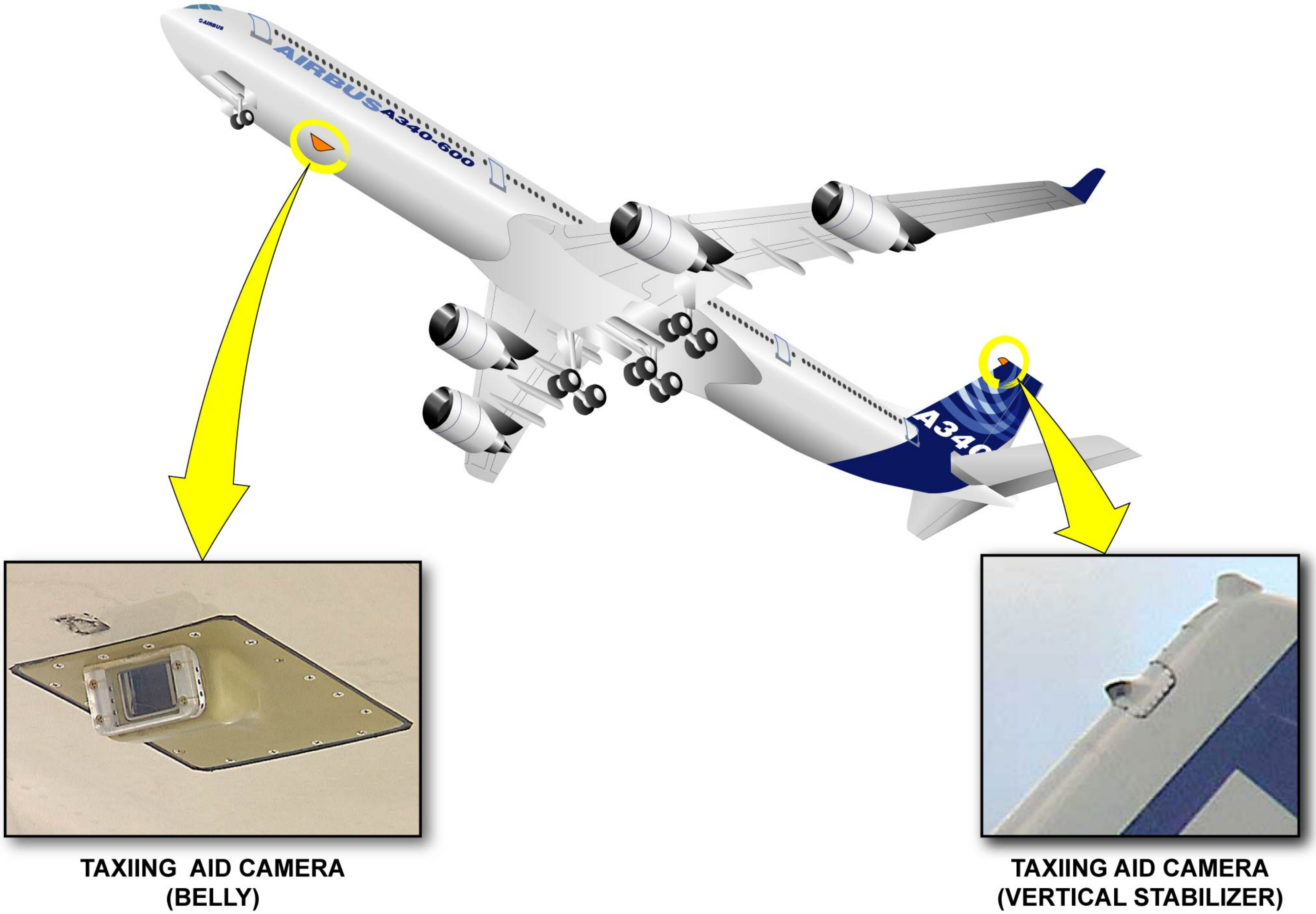
G6B08031 - G10T4T0 - FM23P7000000001

23 COMMUNICATION SYSTEM PRESENTATION (1)

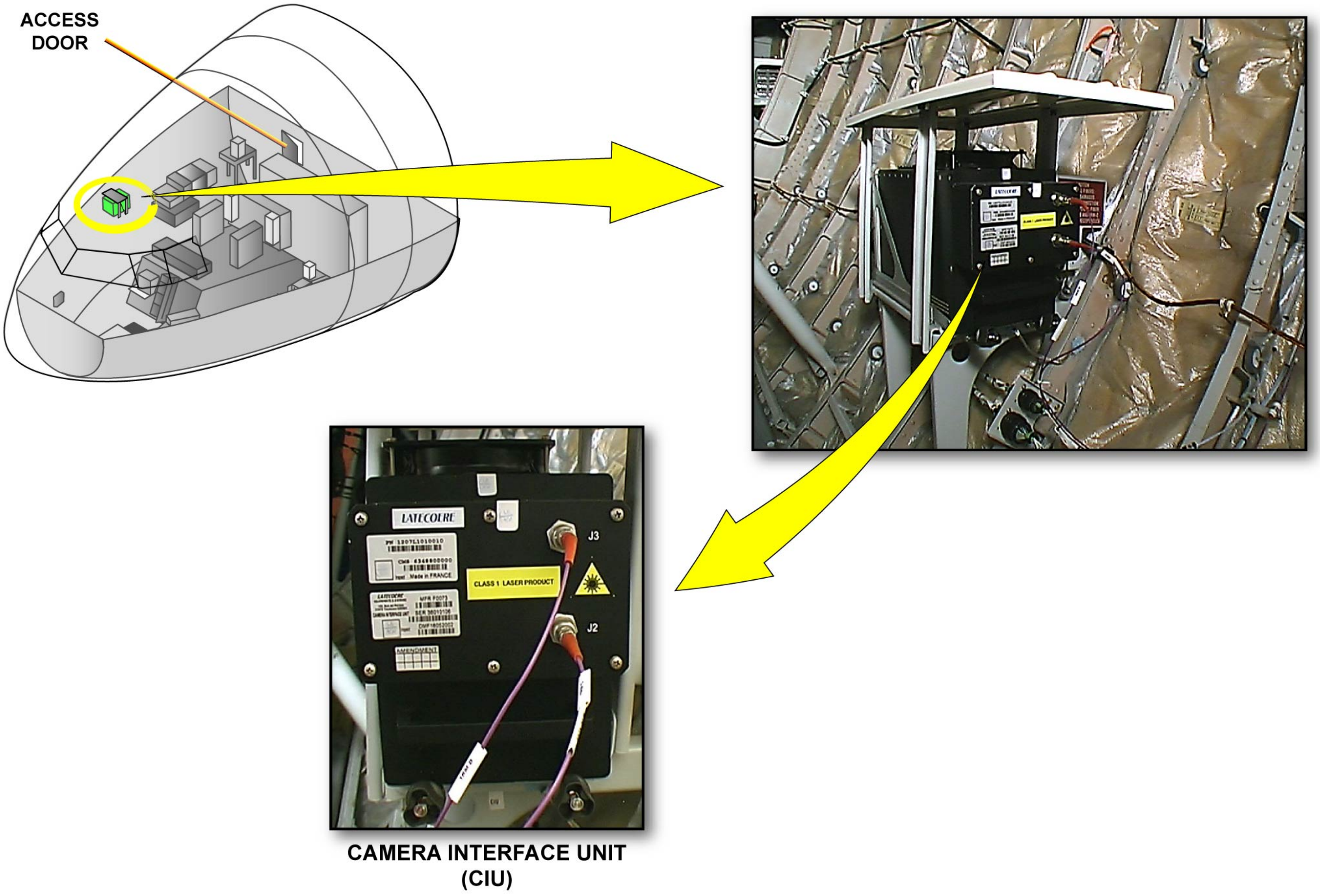
TACS (A340-600) (continued)

COMPONENT LOCATION

The TACS is composed of one camera located under the aircraft belly fairing and one camera installed at the upper part of the vertical stabilizer.
The CIU, which is used to manage the cameras, is located on a specific rack in the avionics bay.



TACS (A340-600) - COMPONENT LOCATION



TACS (A340-600) - COMPONENT LOCATION

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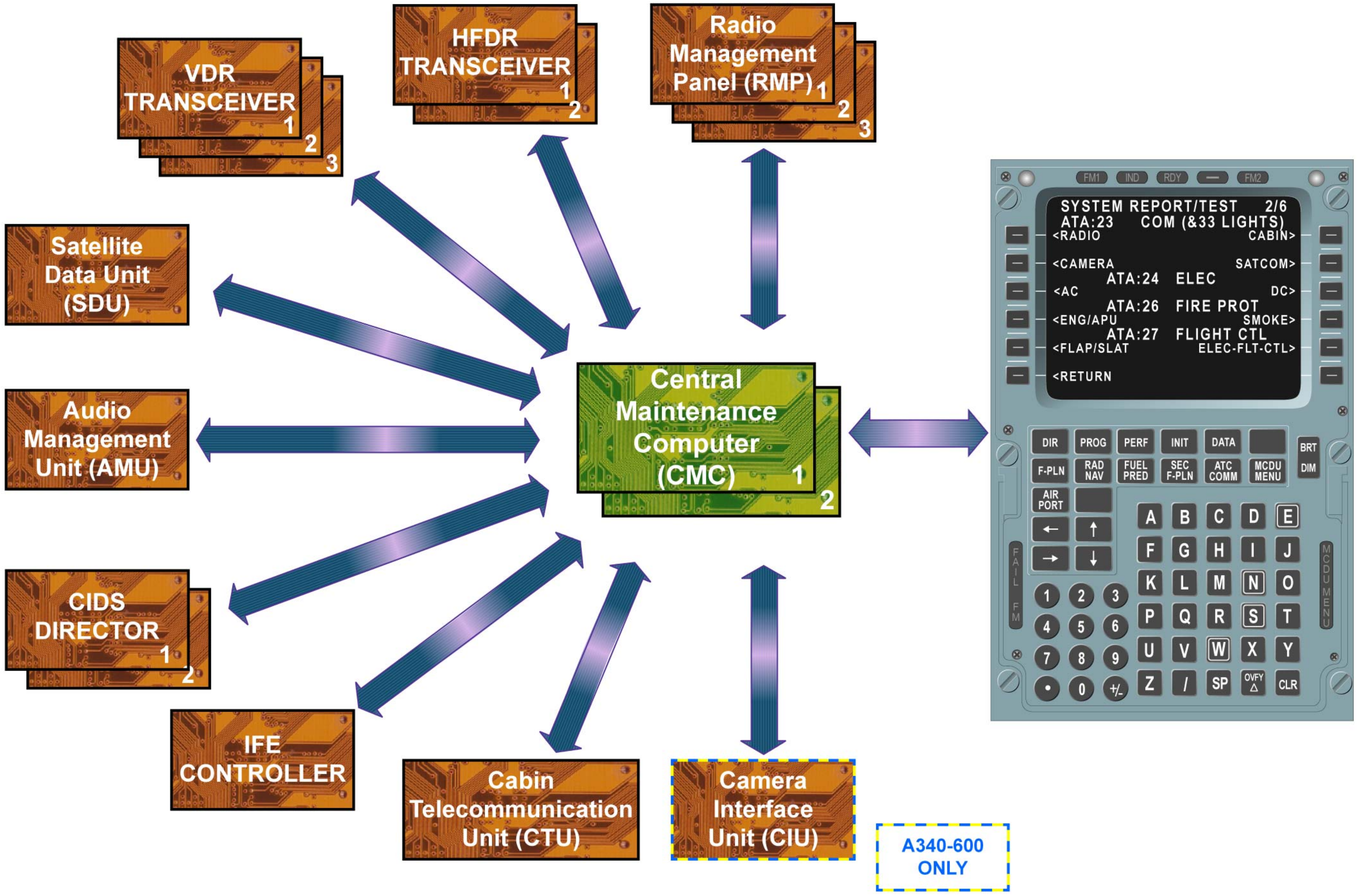
23 COMMUNICATION SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

Each communication computer has a BITE which tests, manages and records failures to help maintenance operations.



MAINTENANCE/TEST FACILITIES

23 COMMUNICATION SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

When you work on aircraft, make sure that you obey all the Aircraft Maintenance Manual (AMM) safety procedures. This will prevent injury to persons and/or damage to the aircraft. Here is an overview of main safety precautions related to the communications system. Make sure that all circuits in maintenance are isolated before you apply electrical power to the aircraft. Unwanted electrical power can be dangerous. Although the HF antenna is mounted near the vertical stabilizer, the RF energy generated during transmissions can cause an explosion if being used during refueling. Do not transmit during refueling. When working on the aircraft make sure that you focus on the tasks. Interruptions can lead to errors. These errors can lead to an accident. To avoid these interruptions, it is prudent to advise the flight crew, ground crew and cabin crew of your progress.

SAFETY PRECAUTIONS

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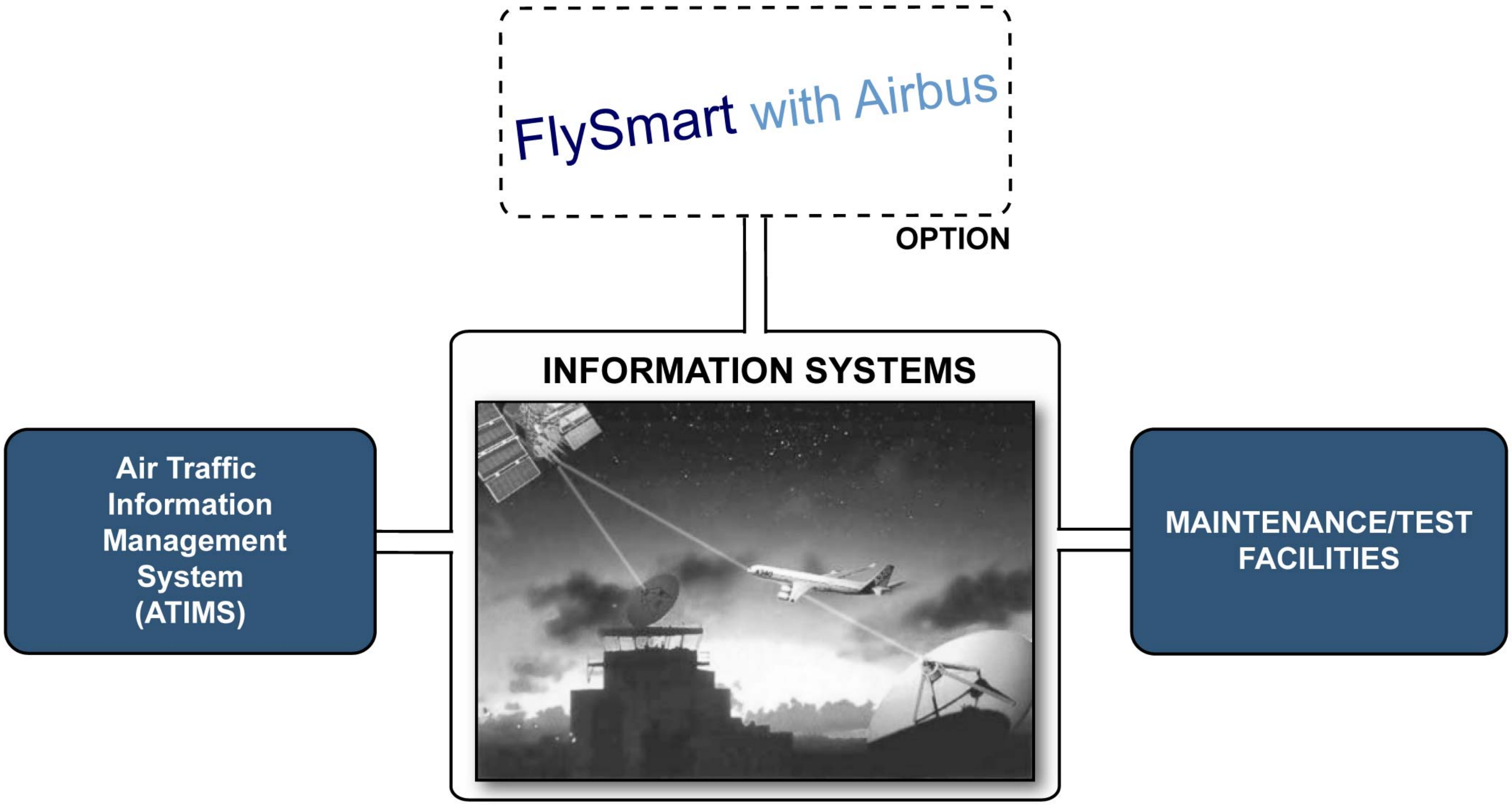
46 INFORMATION SYSTEM PRESENTATION (1)

GENERAL

The Information Systems send data-link transfers between the aircraft and the ground. This chapter is divided into:
- the Air Traffic and Information Management System (ATIMS) with the Airline Operational Control (AOC) and the Air Traffic Control (ATC) functions,
- the optional FlySmart with Airbus (FSA),
- the maintenance/test facilities functions.



GENERAL

G6B08031 - G10T4T0 - FM46P4000000001

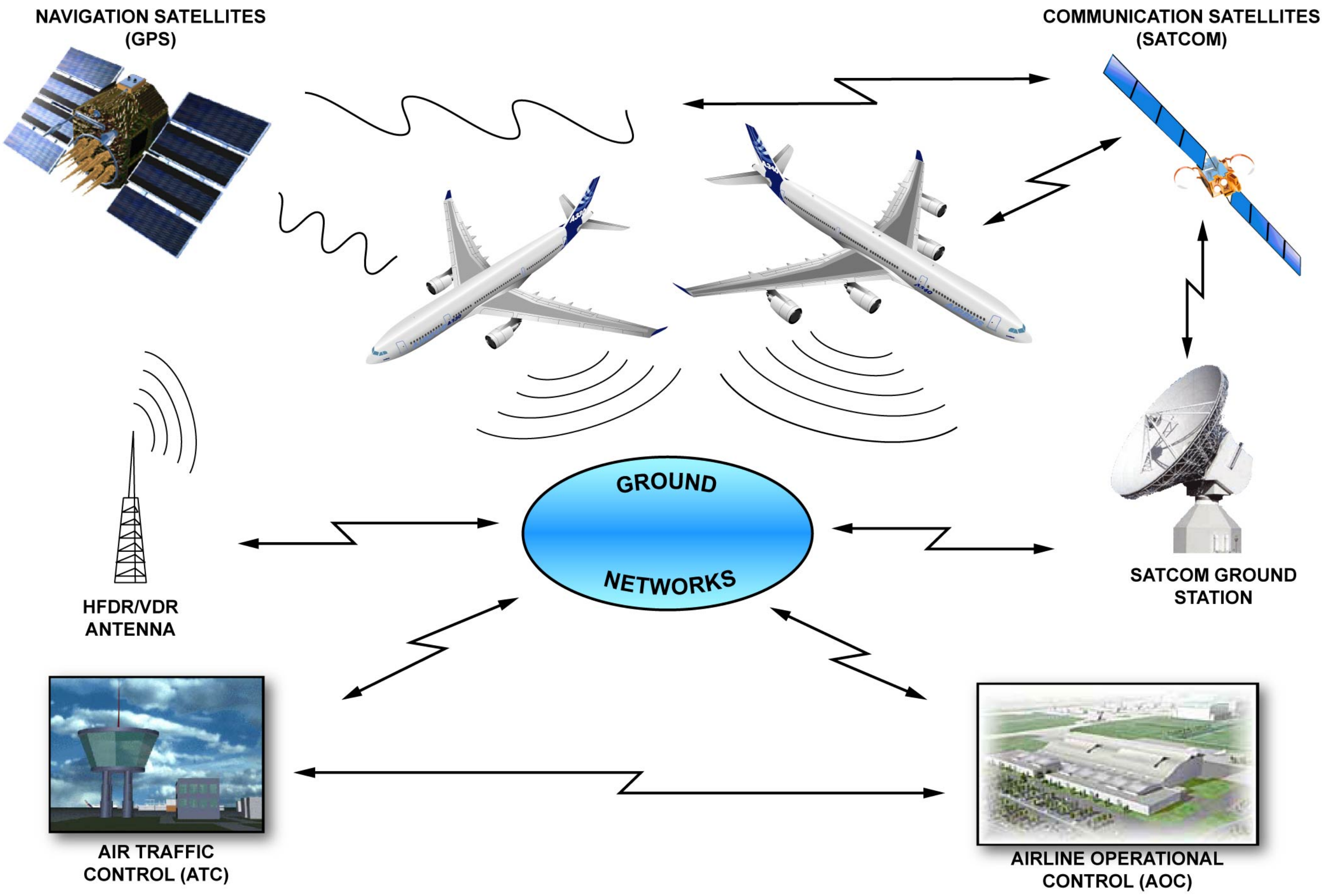
46 INFORMATION SYSTEM PRESENTATION (1)

ATIMS

GENERAL

The ATIMS complies with the future developments of the communication, navigation, surveillance and Air Traffic Management (ATM) also known as Future Air Navigation System (FANS). It covers the evolution of the way the airspace will be used in the years to come. It will be used in different operational environments and is designed to be easily configured to the airlines needs. The ATIMS sends data-link communication: VHF Data Radio (VDR), HF Data Radio (HFDR) and Satellite Communication (SATCOM) and the exchange of complex data or specific reports between the aircraft and the ground centers:
- Controller Pilot DataLink Communications (voice in backup) for ATM,
- automatic reporting (position, intention) for air traffic surveillance,
- specific airline/aircraft communications (operational control) to improve airline operational costs and flexibility.

Standard AOC functionalities are usually given but airlines can customize these functions and the way they are accessed by the crew. On the ground, the different existing networks dispatch the messages. These networks are operated by private companies such as ARINC, SITA and others, which are known as service providers.



ATIMS - GENERAL

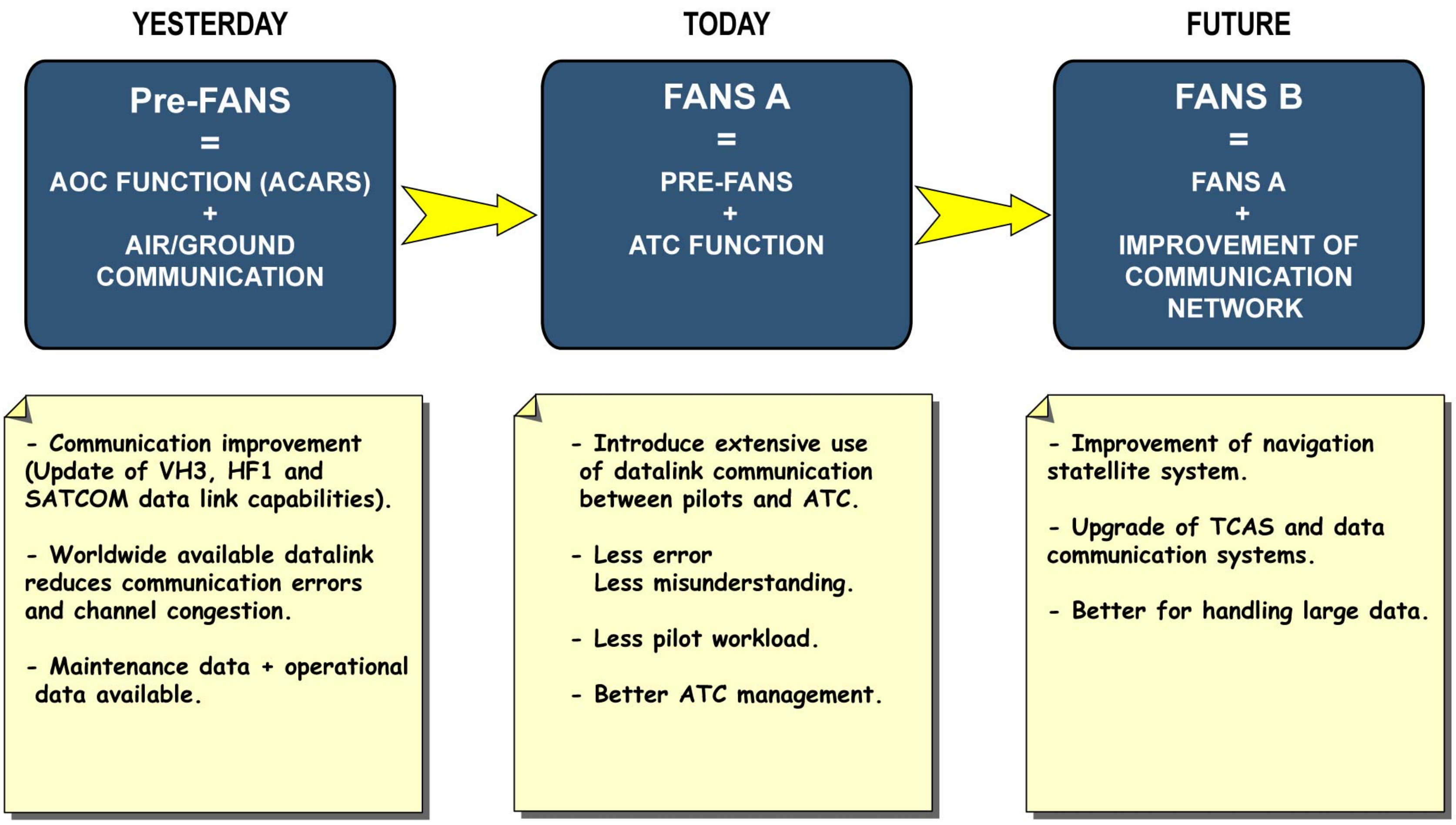
46 INFORMATION SYSTEM PRESENTATION (1)

ATIMS (continued)

PRE-FANS, FANS

There are three stages of FANS development.
- pre-FANS, with communications (COM) and AOC functions,
- FANS A (pre-FANS + ATC functions) and,
- FANS B (FANS A + improved ground network + Traffic alert and Collision Avoidance System (TCAS)).

Today, the AOC function can be used in pre-FANS configuration. It gives to the crew Aircraft Communication Addressing and Reporting System (ACARS) equivalent functionalities and more, as for instance:
- NOtice To AirMen (NOTAM), weather, winds aloft requests,
- free text message exchanges,
- diversion, delay, refueling, flight reports,
- aircraft data from Central Maintenance System (CMS), Aircraft Condition Monitoring System (ACMS), cabin terminal...etc.



ACARS: Aircraft Communication Adressing and Reporting System
AOC: Airline Operational Control
ATC: Air Traffic Control
FANS: Future Air Navigation System

ATIMS - PRE-FANS, FANS

46 INFORMATION SYSTEM PRESENTATION (1)

ATIMS (continued)

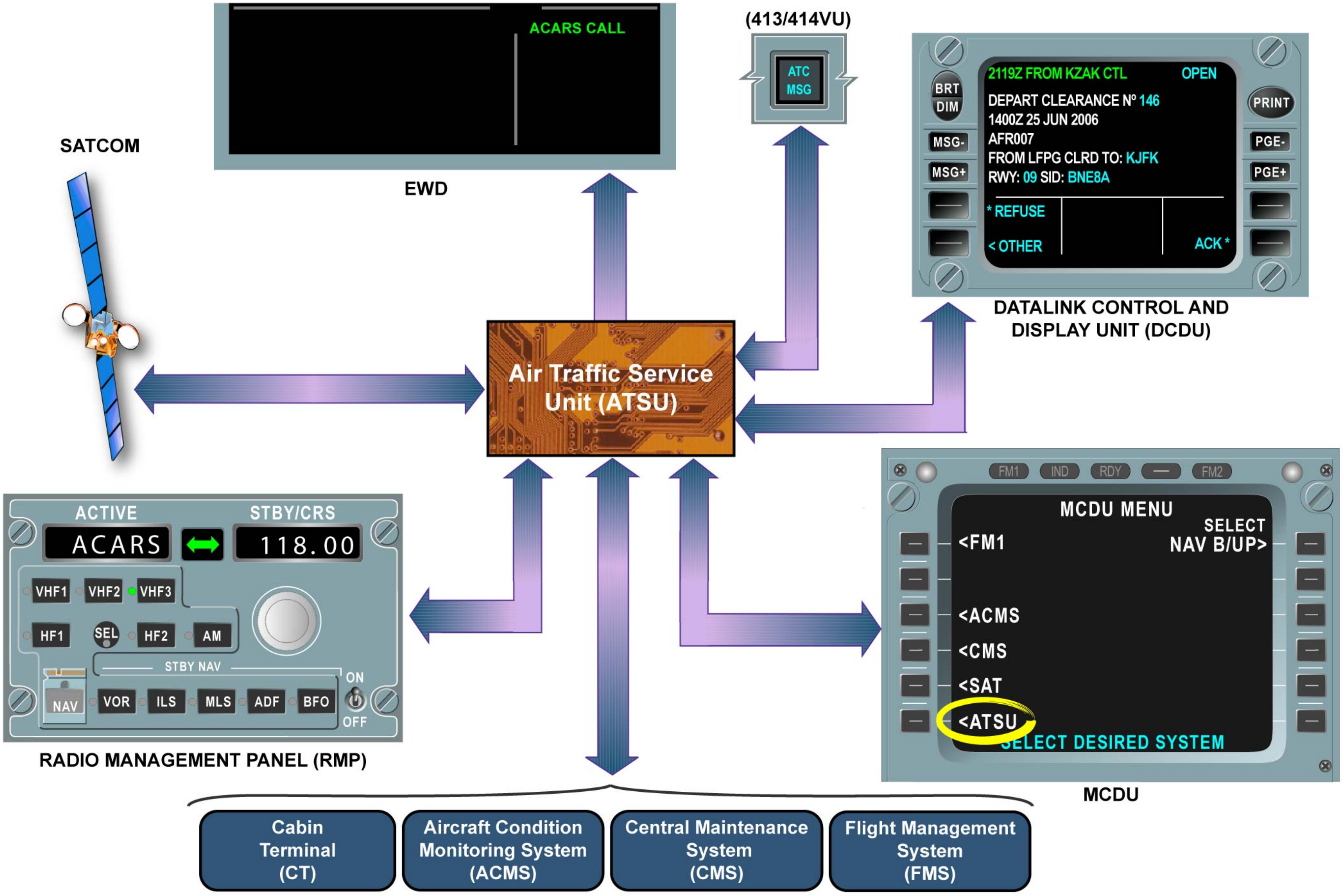
ARCHITECTURE

The ATIMS pre-FANS configuration mainly has an Air Traffic Service Unit (ATSU), which is used:
- to manage communications (air/ground data-links),
- to manage applications (on board data routing).

The communication devices include:
- the SATCOM,
- the VDR,
- the HFDR.

The pre-FANS crew interfaces include the ECAM, and the MCDU.
For FANS-A and FANS-B equipped aircraft there are:
- two Datalink Control and Display Units (DCDUs),
- two attention getter P/Bs, marked "ATC MeSsaGe",
- the MCDU "ATC COM" key operative.

The ATSU also manages the communication message exchanges to and from the peripheral computers (on-board routing function).



ATIMS - ARCHITECTURE

G6B08031 - G10T4T0 - FM46P4000000001

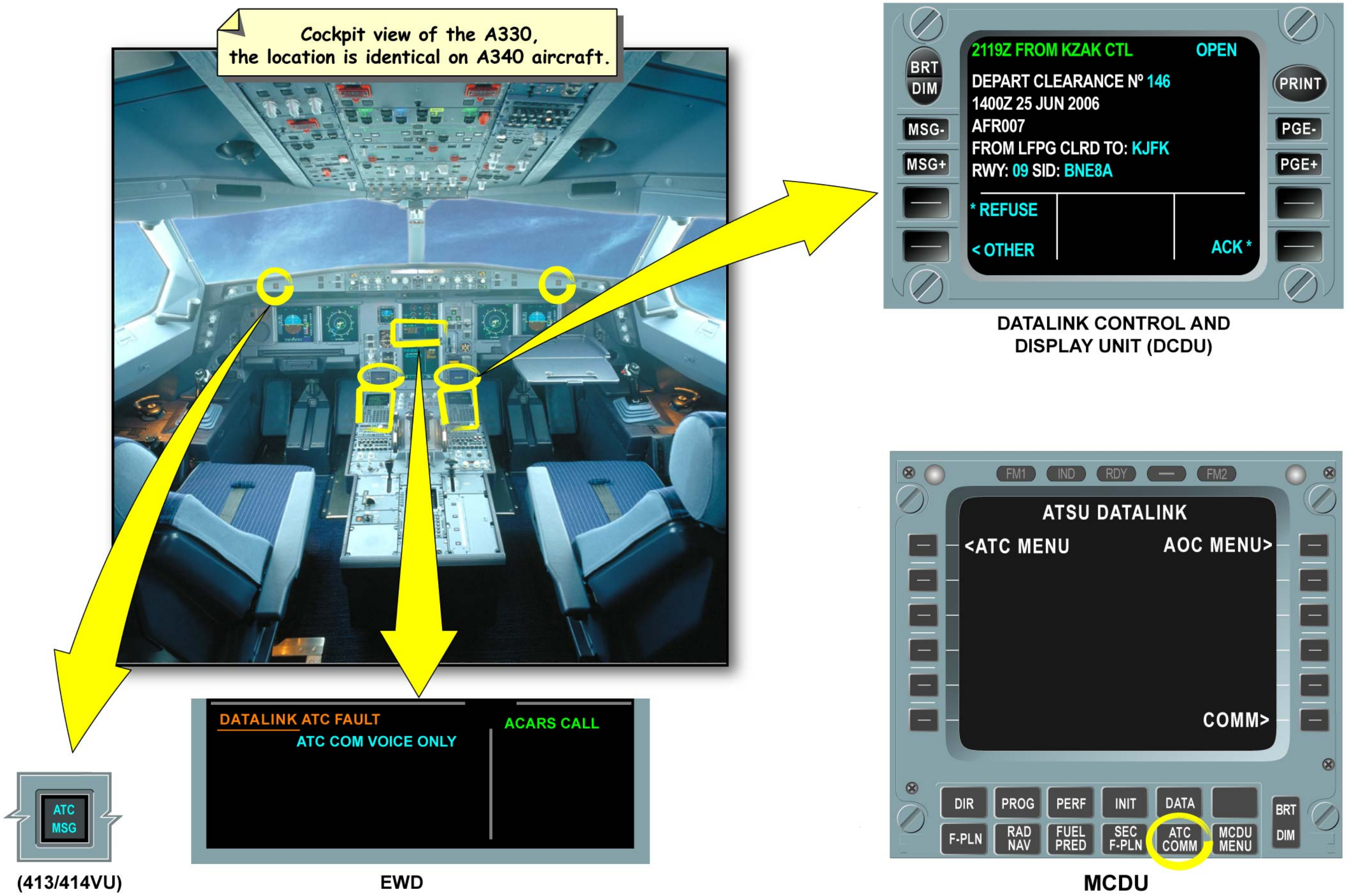
46 INFORMATION SYSTEM PRESENTATION (1)

ATIMS (continued)

CONTROL & INDICATING

In FANS configuration the ATC MENU prompt is available on the MCDU to get access to ATC pages. The ATC COMM key gives the same access but as a shortcut. Two ATC MSG P/Bs are operative and indicate ATC incoming messages. Two DCDUs give full time accessibility and readability for messages exchanged between the ATC and crew. Text messages instead of voice communication reduce the risk of misunderstanding.

NOTE: The DCDUs are the interfaces for ATC messages only.



ATIMS - CONTROL & INDICATING

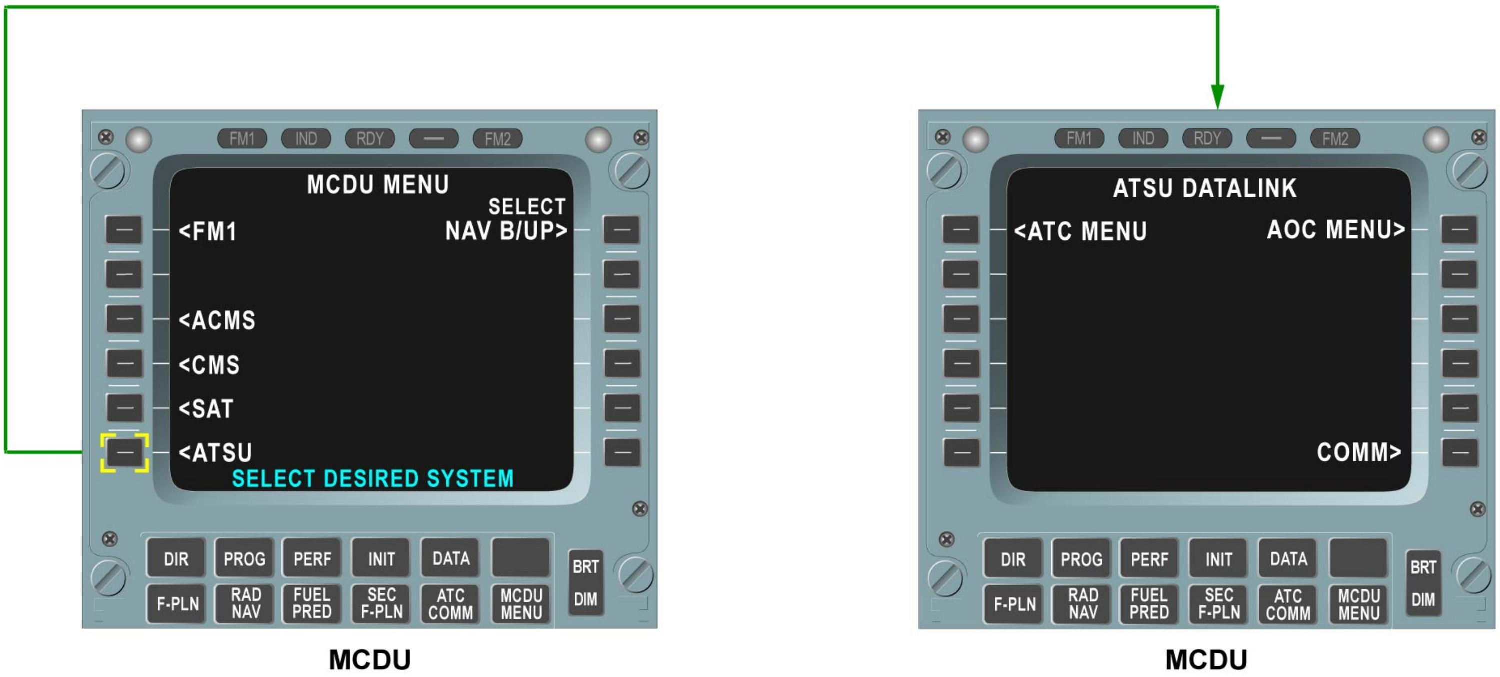
46 INFORMATION SYSTEM PRESENTATION (1)

ATIMS (continued)

MCDU MENU

The COMM MENU is used for communication settings, as selection of the service provider and frequency. The AOC MENU line key gives access to the AOC MENU which is equivalent to ACARS functionalities. The content of this menu depends on the AOC applications selected by the airline. The ATC MENU gives access to the least frequent ATC operations, which are:
- data entry for message preparation,
- access to previously exchanged messages (MSG LOG).

Note that the ATC COMM key has the same functions as ATC MENU but provides quick access to the page whatever the MCDU menus displayed.



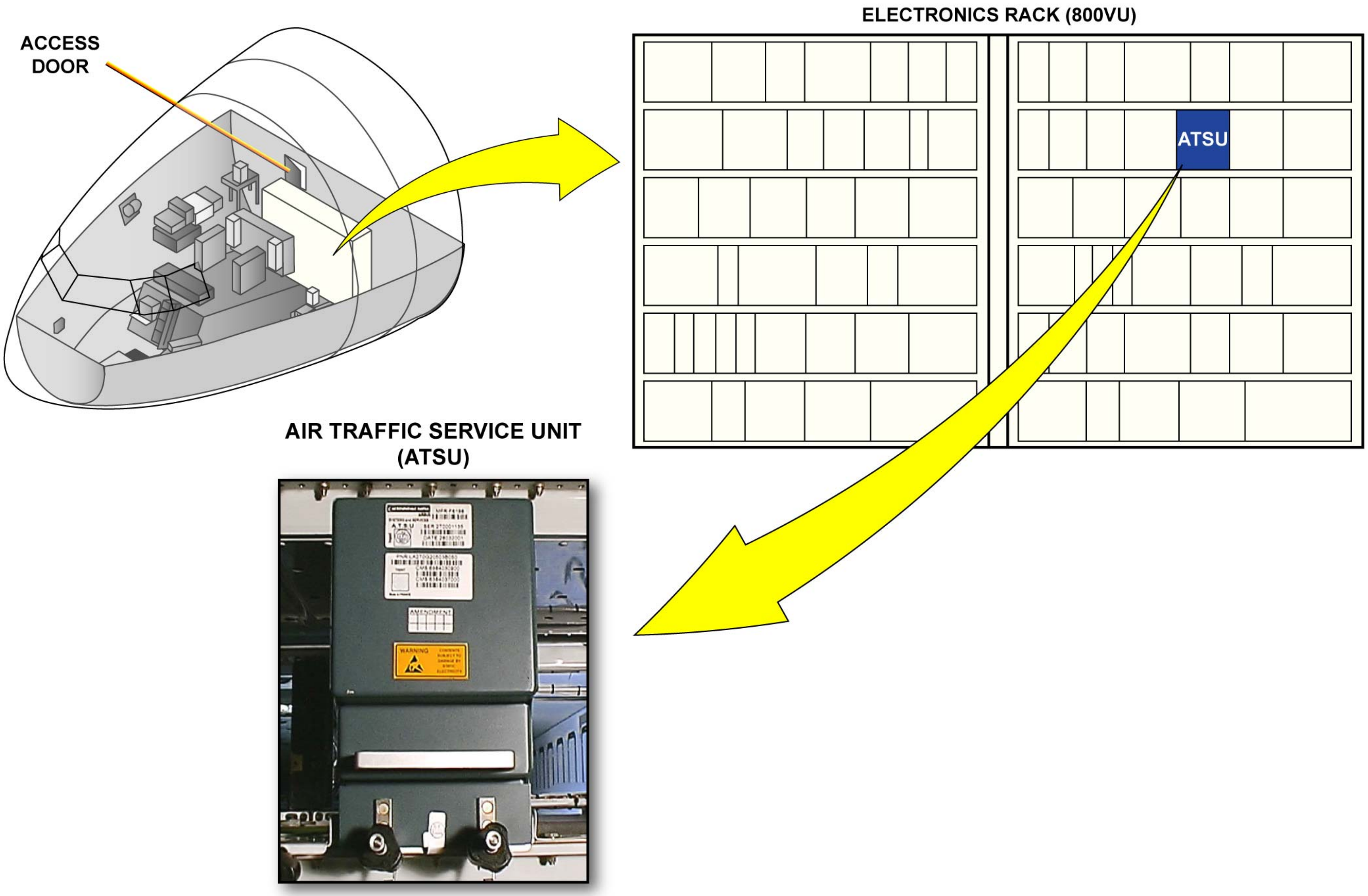
ATIMS - MCDU MENU

46 INFORMATION SYSTEM PRESENTATION (1)

ATIMS (continued)

COMPONENT LOCATION

The ATSU is the main component of the ATIMS located in the avionics compartment.



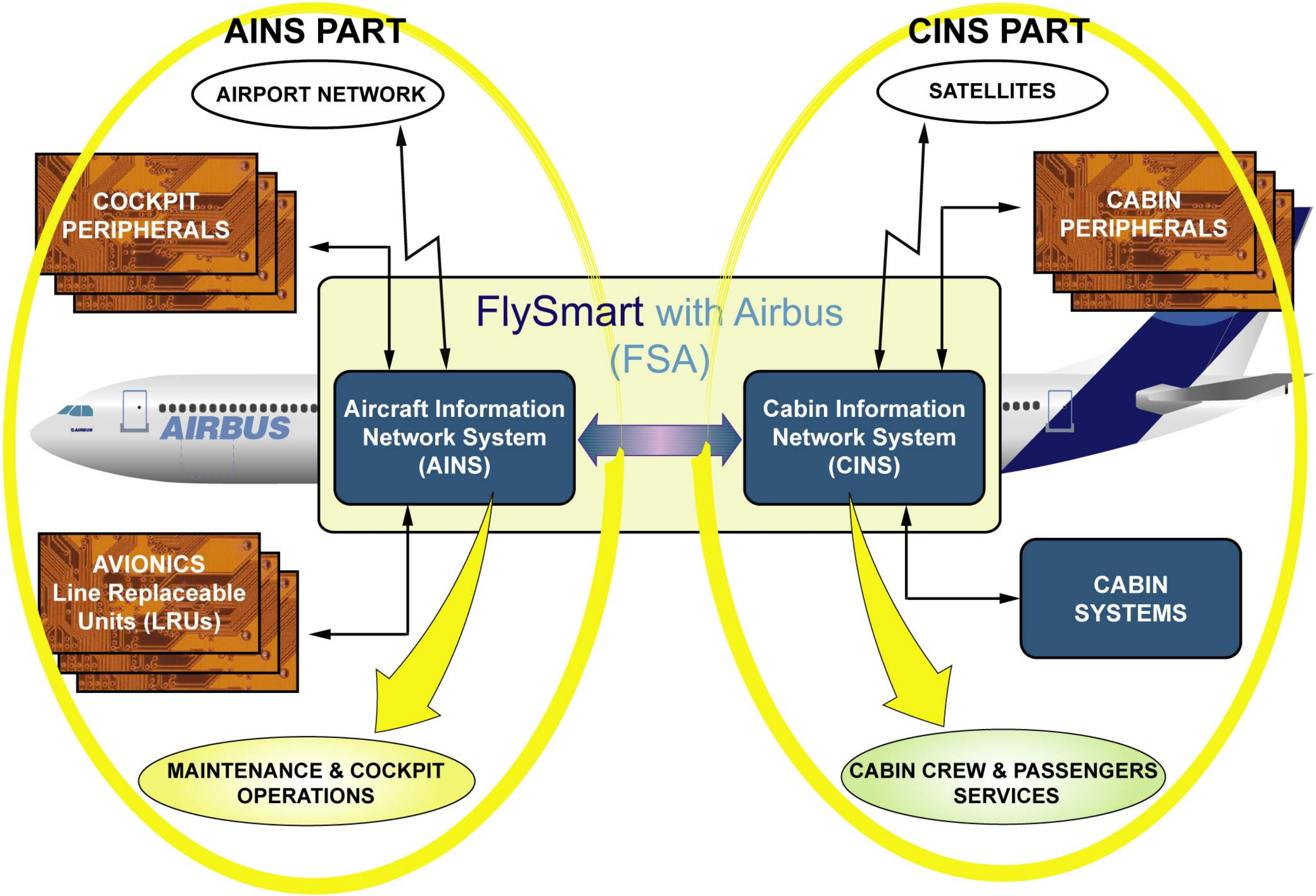
ATIMS - COMPONENT LOCATION

46 INFORMATION SYSTEM PRESENTATION (1)

FLYSMART WITH AIRBUS (FSA)

GENERAL

The FlySmart with Airbus (FSA) system is composed of two systems: the Aircraft Information Network System (AINS), which is the maintenance and operations part of the FSA while the Cabin Information Network System (CINS) is the passenger part of the FSA. The main objective of the FSA system is to install, in the aircraft, a cost-effective system to implement new electronic services for flight operations, maintenance and passengers.



FLYSMART WITH AIRBUS (FSA) - GENERAL

46 INFORMATION SYSTEM PRESENTATION (1)

FLYSMART WITH AIRBUS (FSA) (continued)

CINS APPLICATION

The CINS gives access to the cabin crew applications and to the passenger's applications. The functions of the cabin crew applications are:
- crew e-mails,
- electronic logbook,
- electronics manuals (Cabin Crew Operating Manual (CCOM)),
- cabin inventory,
- cabin management,
- credit card validation.

The functions of the passenger applications are:
- internet access,
- possibility to consult the e-mail and the Short Message Service (SMS),
- e-commerce,
- access to the news and the sports,
- live television,
- entertainment.

AINS APPLICATION

The AINS gives access to flight crew applications and to the maintenance applications. The functions are:
- the Less Paper Cockpit including the weight and balance module, the take off module, the landing module, the performance calculations and the electronics manuals (Flight Crew Operating Manual and Minimum Equipment List (MEL)),
- the electronic logbook,
- the e-mail function which enables reception of graphical weather, charts and maps.

The functions of the maintenance applications are:
- the electronic maintenance manuals through Airn@v,
- an electronic logbook and MEL,
- system performance monitoring,
- flight operations monitoring,
- data loading.

AINS PART

FlySmart with Airbus (FSA)

- **FLIGHT CREW APPLICATIONS :**
  - ELECTRONIC LOGBOOK
  - WEIGHT & BALANCE
  - PERFORMANCE DATA
  - OPERATIONAL CHECKLISTS
  - ACCESS TO FLIGHT INFORMATION SERVICES (WEATHER, NOTAM...)
  - CHARTS AND MAPS
  - CREW E-MAIL
  - AIRLINE SPECIFIC TOOLS..
- **CARGO APPLICATIONS :**
  - CUSTOMS CLEARANCE
  - CARGO MONITORING...
- **MAINTENANCE APPLICATIONS :**
  - MAINTENANCE DOCUMENTATION
  - AIRCRAFT CONDITION MONITORING
  - ELECTRONIC LOGBOOK
  - DATA LOADING
  - E-MAIL
  - OPERATIONAL S/W AND DATA BASES STORAGE
  - EQUIPMENT LIST...

CINS PART

- **CABIN CREW APPLICATIONS :**
  - PAX DATA BASE
  - CREW E-MAIL
  - CABIN E-LOGBOOK
  - AIRCRAFT DOCUMENTATION
  - CREDIT CARD VALIDATION
  - CABIN INVENTORY
  - QUALITY MONITORING
  - RESERVATIONS...
- **PASSENGERS APPLICATIONS :**
  - E-MAIL
  - INTRANET, INTERNET
  - NEWS, SPORTS, LIVE TV
  - E-COMMERCE...

Optional and highly customizable system

FLYSMART WITH AIRBUS (FSA) - CINS APPLICATION & AINS APPLICATION

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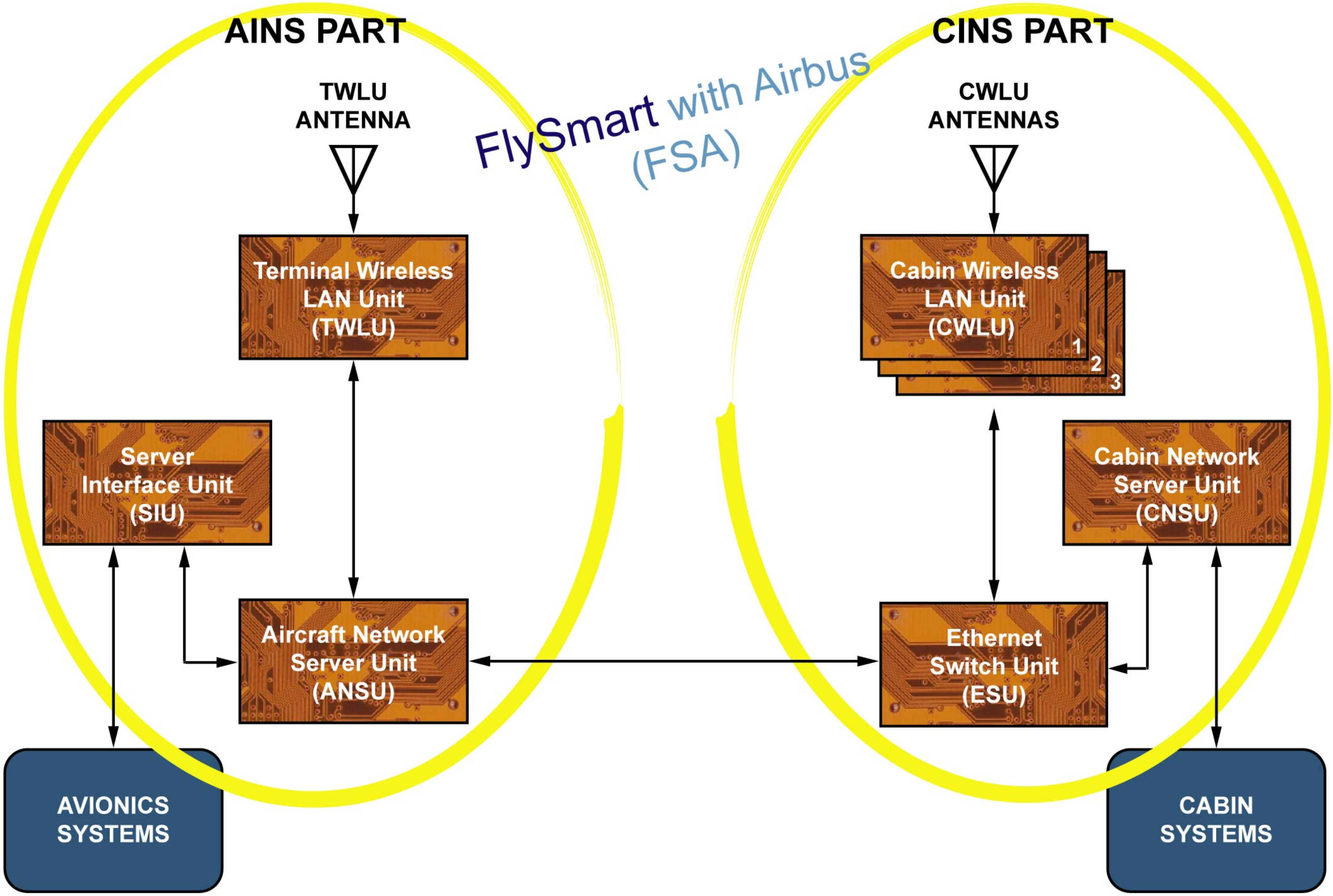
46 INFORMATION SYSTEM PRESENTATION (1)

FLYSMART WITH AIRBUS (FSA) (continued)

SYSTEM OVERVIEW

The Aircraft Network Server Unit (ANSU) provides system processing, data storage and network communication services to devices and systems. It is primarily dedicated to applications and services for aircraft operation and maintenance. The ANSU is able to host customized applications and services. It interfaces with the Terminal Wireless LAN Unit (TWLU) and with the Cabin Wireless LAN Units (CWLUs) via the Ethernet Switch Unit (ESU). The Server Interface Unit (SIU) acts primarily as firewall to protect the avionics equipment. The SIU interfaces with the existing aircraft avionics equipment to collect and send aircraft data within the network. The TWLU and its antenna are used to bridge a wireless connection between the on-board Local Area Network (LAN) and the ground based LAN (typically at an airport). The Cabin Network Server Unit (CNSU) administers system-processing, data storage and network communication services to devices and systems. The CNSU is dedicated to cabin and passenger oriented requests, with highly customized features (e-mail, Internet/Intranet). The CNSU is also able to host customized applications and services. The ESU fulfills a wired network connection between the connected systems based on ARINC 664/IEEE 802.3 Ethernet for standard protocols such as Internet protocols (TCP/IP). The cabin wireless LAN includes the CWLU and the antennae. They fulfill a wireless network connection between devices within the aircraft structure and those connected to the wired Ethernet LAN (ELAN).



FLYSMART WITH AIRBUS (FSA) - SYSTEM OVERVIEW

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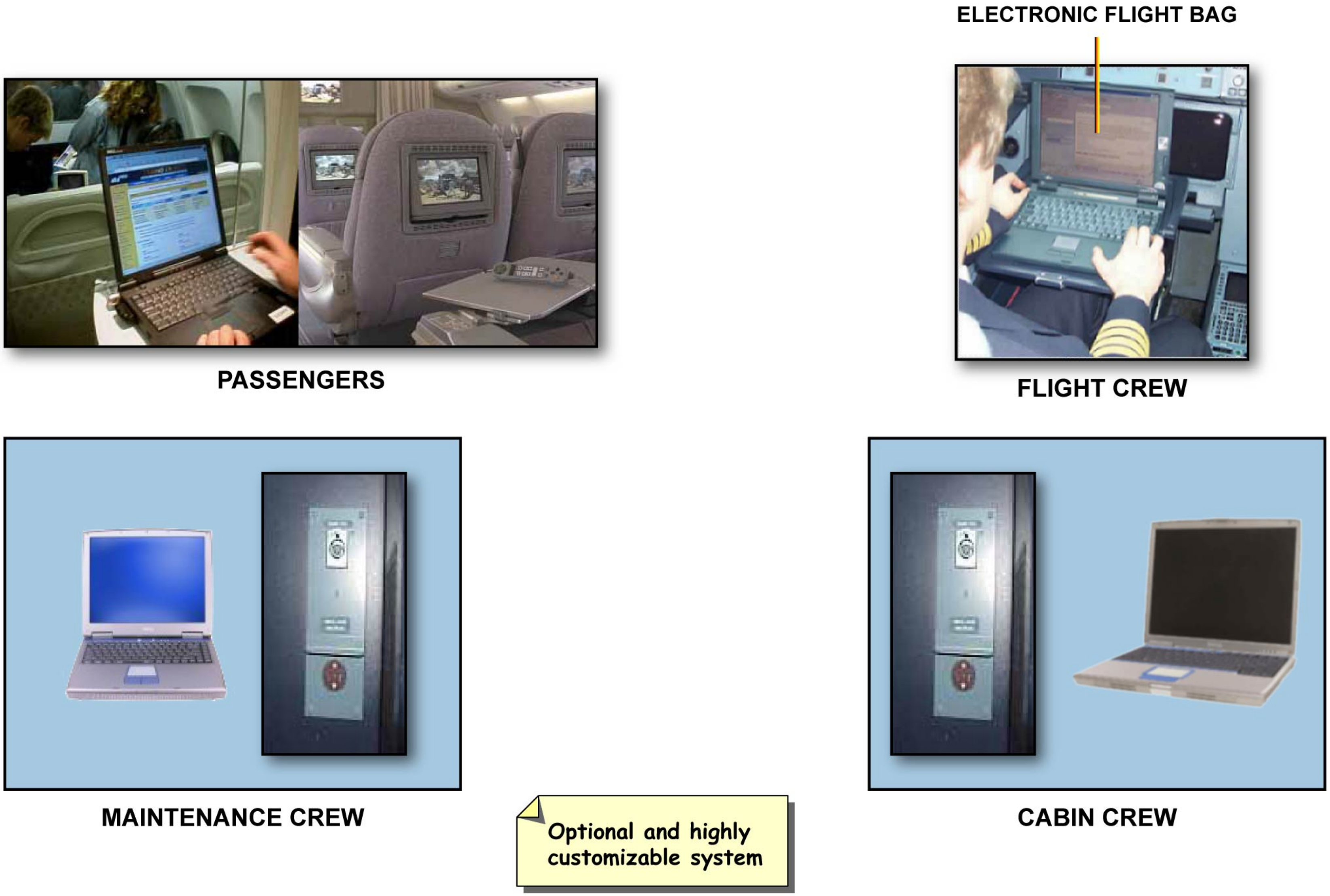
46 INFORMATION SYSTEM PRESENTATION (1)

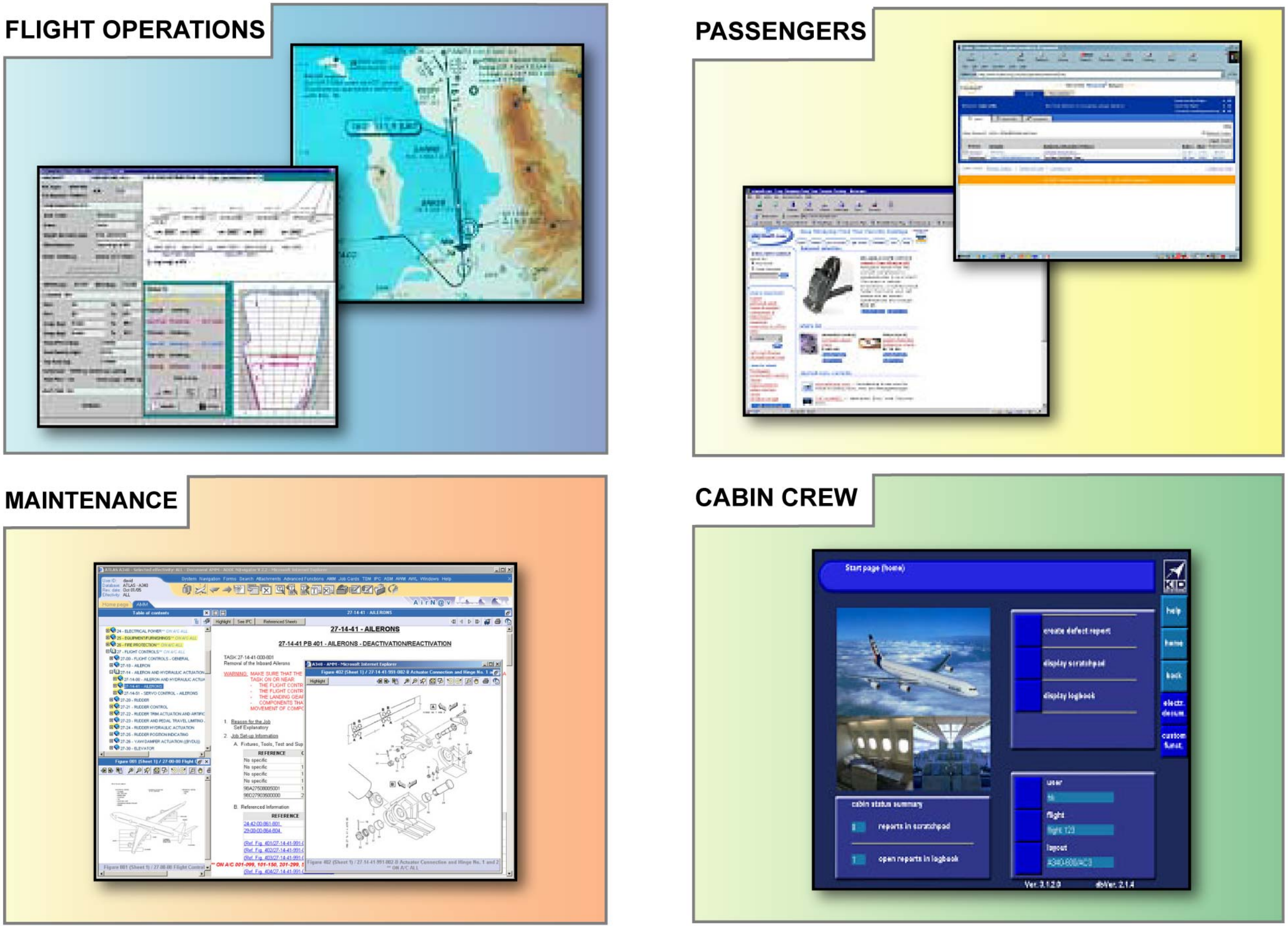
FLYSMART WITH AIRBUS (FSA) (continued)

CONTROL & INDICATING

The cockpit and the cabin have a 110V AC and data outlets for wired/wireless crew and maintenance laptops. The passengers can connect the passenger applications via their own personal laptop and/or their interactive seat-display. The wireless connectivity is available through the whole aircraft.
The diagram shows typical applications for the system users :
- electronic flight bag,
- internet,
- maintenance documentation,
- cabin e.logbook.



FLYSMART WITH AIRBUS (FSA) - CONTROL & INDICATING



FLYSMART WITH AIRBUS (FSA) - CONTROL & INDICATING

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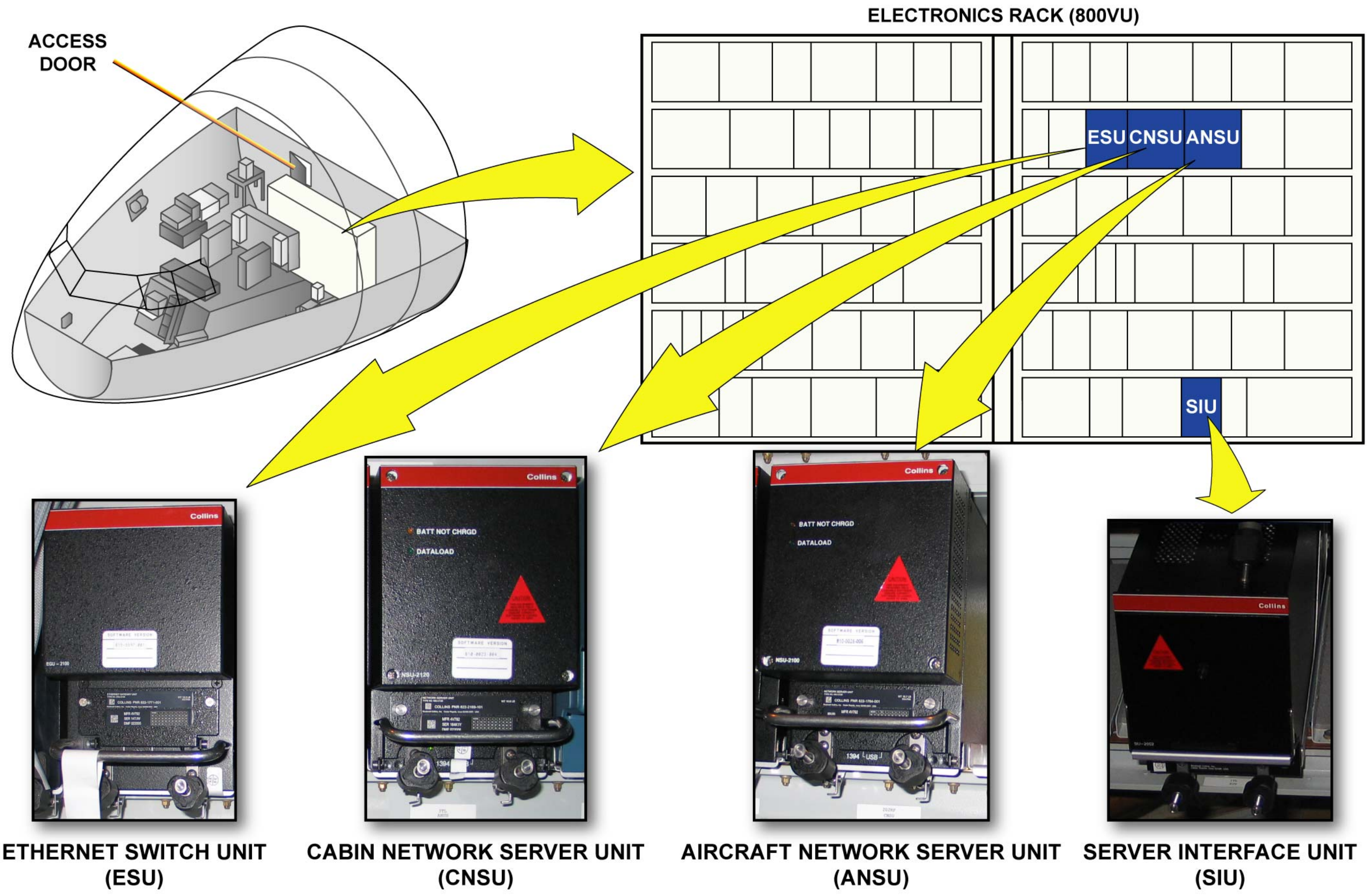
46 INFORMATION SYSTEM PRESENTATION (1)

FLYSMART WITH AIRBUS (FSA) (continued)

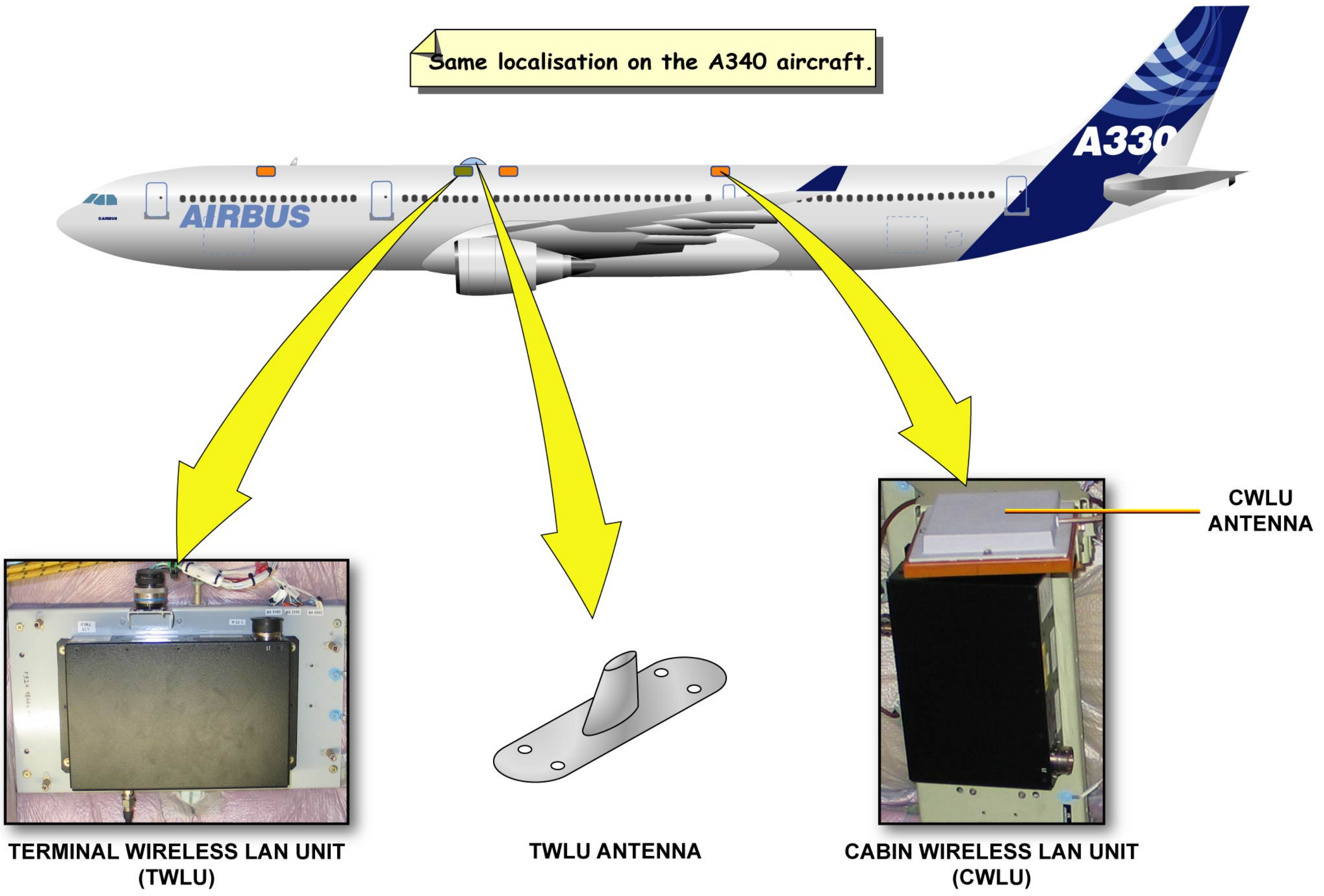
COMPONENT LOCATION

The ESU, the CNSU, the ANSU and the SIU are located in the main avionics bay in the avionics compartment.
The 3 CWLUs and their antennas are installed behind the ceiling panel above the cabin ceiling. The TWLU is installed above the cabin ceiling and its antenna is located on the upper part of the aircraft fuselage.



FLYSMART WITH AIRBUS (FSA) - COMPONENT LOCATION

G6B08031 - G10T4T0 - FM46P4000000001



FLYSMART WITH AIRBUS (FSA) - COMPONENT LOCATION

G6B08031 - G10T4T0 - FM46P4000000001

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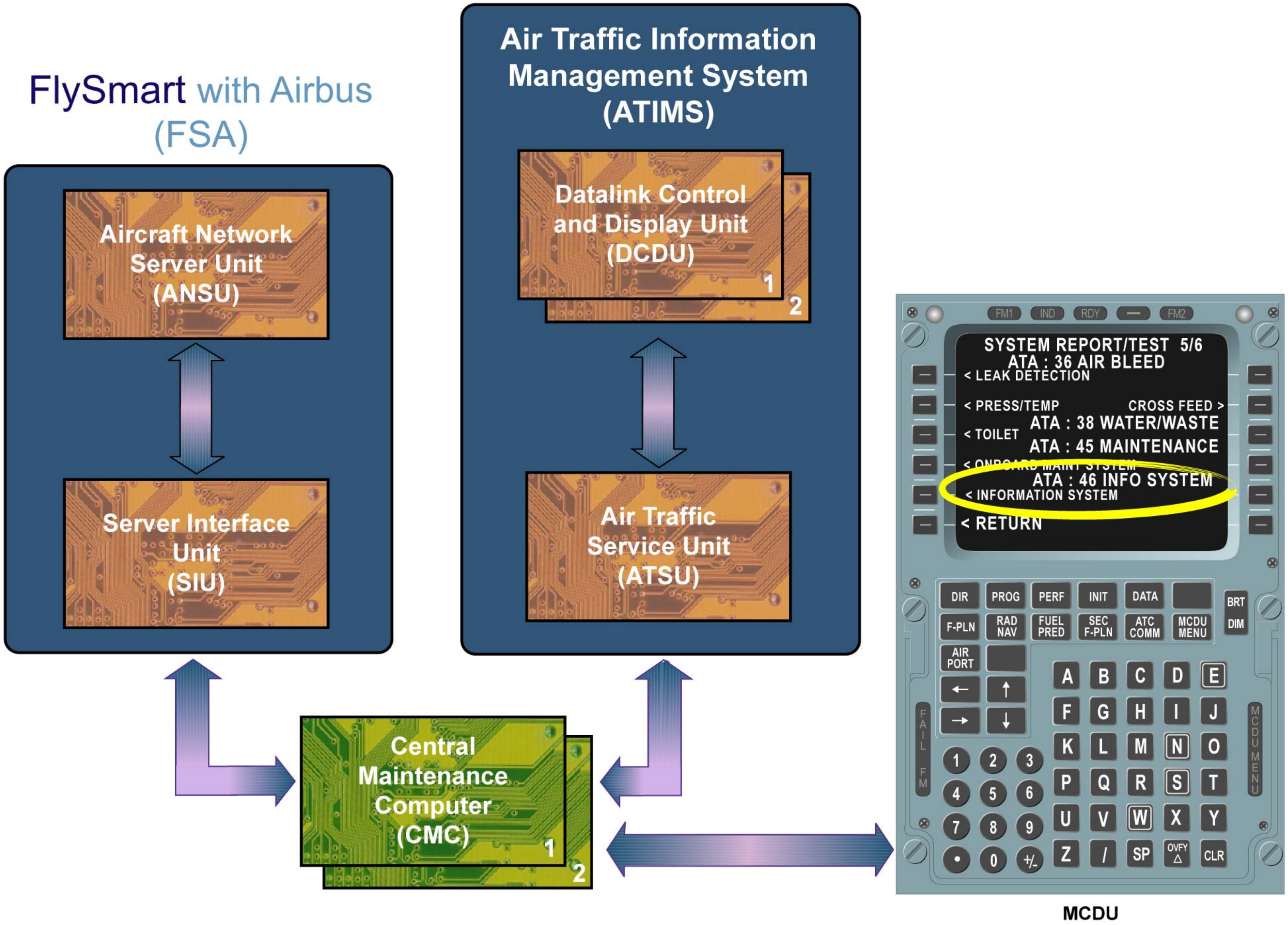
46 INFORMATION SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

The ATIMS BITE information and test requests are transmitted to the CMS and is available through MCDU menus. The ATIMS maintenance menu is accessible using the INFORMATION SYSTEM prompt from the SYSTEM REPORT/TEST page. The ATSU and DCDU internal monitoring gives all the failure information to the ATIMS BITE. The FSA BITE consultation via MCDU enables access to:
- FSA normal mode report including open world and avionics world,
- SIU interactive mode.

The SIU and the ANSU gives all the failure information to the FSA BITE.



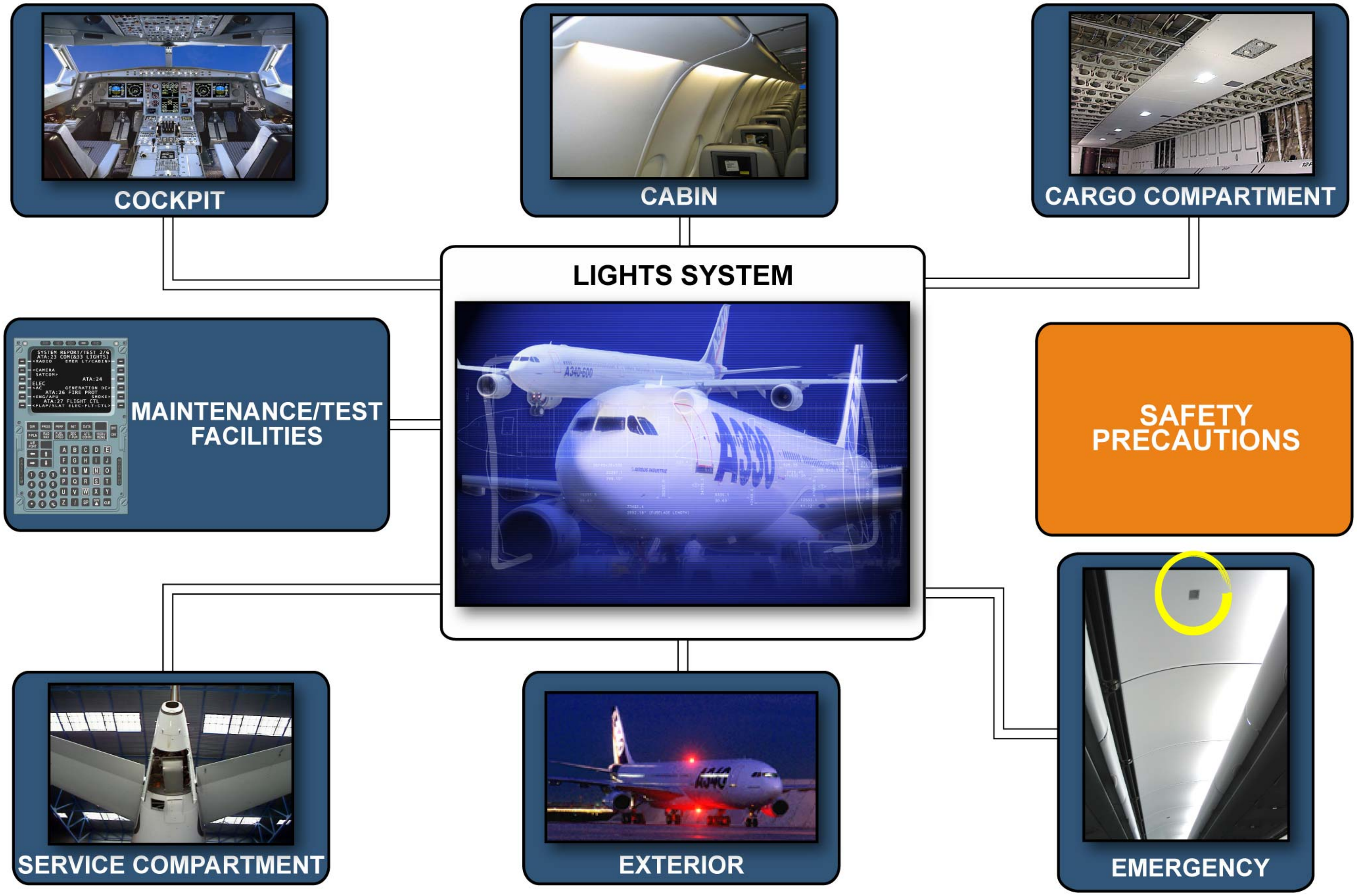
MAINTENANCE/TEST FACILITIES

33 LIGHTS SYSTEM PRESENTATION (1)

GENERAL

The A/C lighting system supplies internal and external lighting. The lighting system is comprised of the following subsystems:
- cockpit lights,
- cabin lights,
- cargo compartments lights,
- service compartments lights,
- exterior lights,
- emergency lights,
- and maintenance/test facilities.

When you work on the A/C, you must obey all the safety procedures listed in the Aircraft Maintenance Manual (AMM).


COCKPIT
CABIN
CARGO COMPARTMENT
LIGHTS SYSTEM
MAINTENANCE/TEST FACILITIES
SAFETY PRECAUTIONS
SERVICE COMPARTMENT
EXTERIOR
EMERGENCY

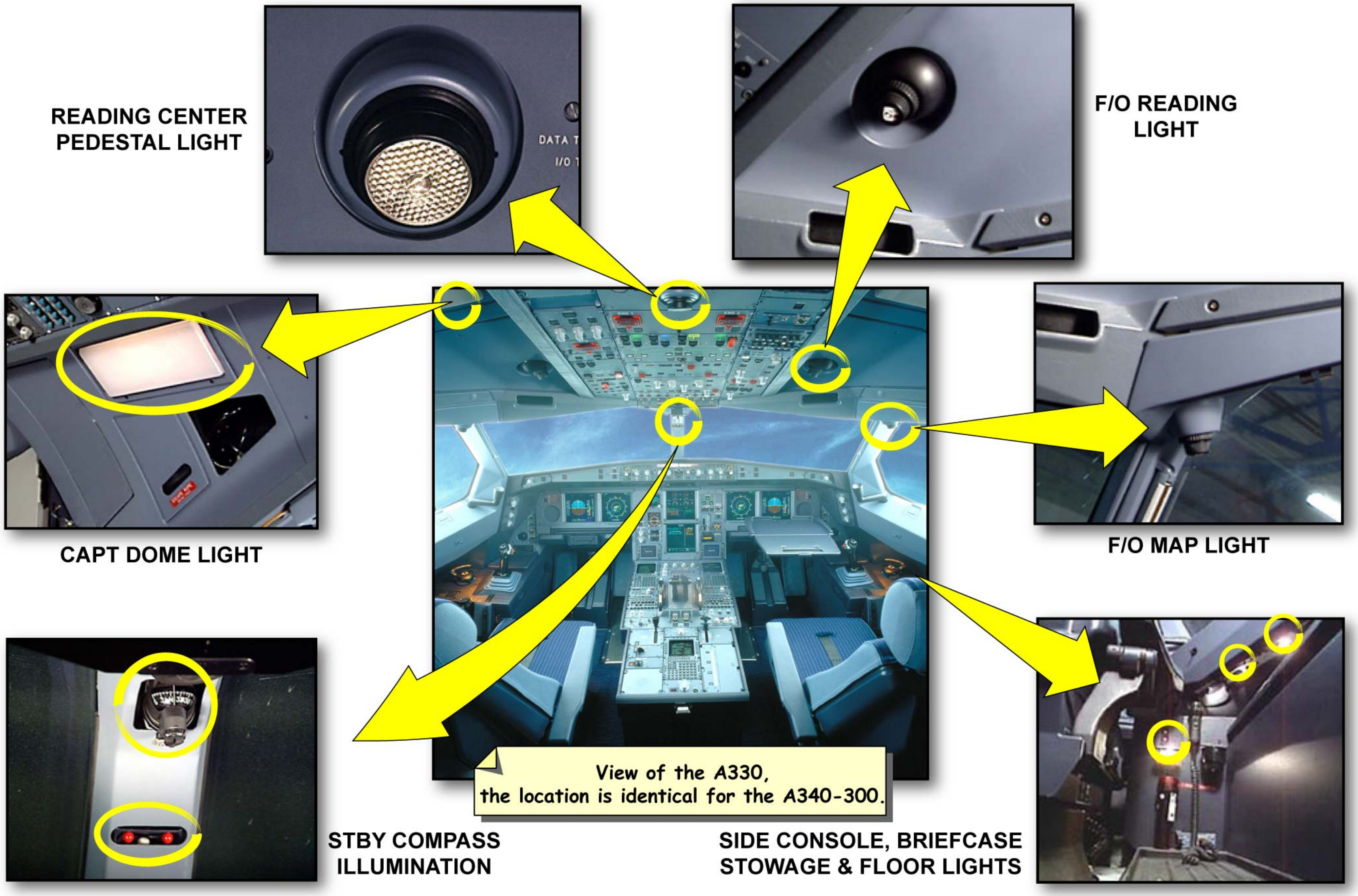
GENERAL

33 LIGHTS SYSTEM PRESENTATION (1)

COCKPIT LIGHTS

GENERAL

The cockpit lighting system lets the flight crew see all the equipment details in the cockpit. The cockpit lighting has:
- general lighting,
- instrument and panel integral lighting,
- annunciator light test and dimming.



COCKPIT LIGHTS - GENERAL

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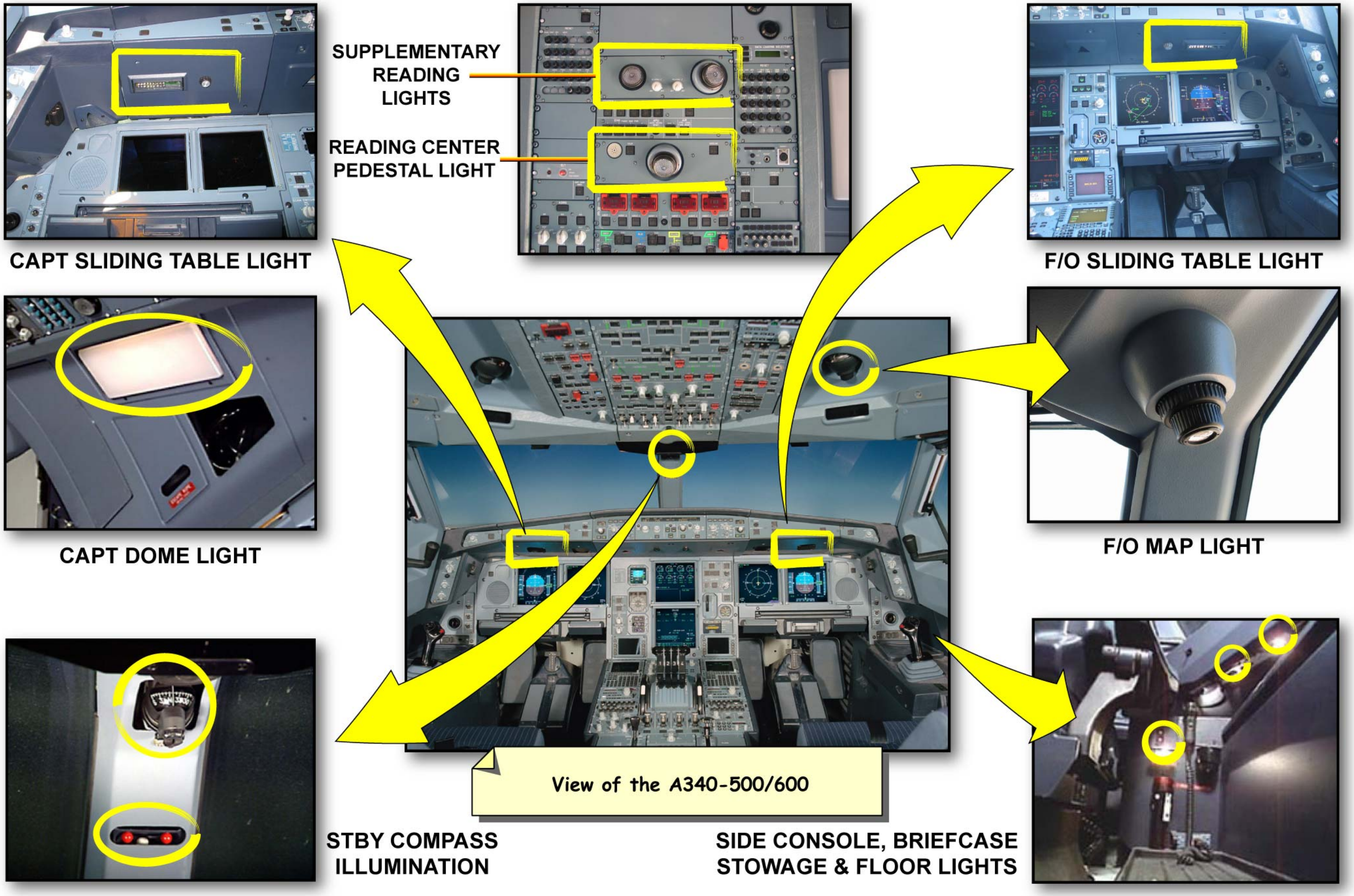

COCKPIT LIGHTS - GENERAL

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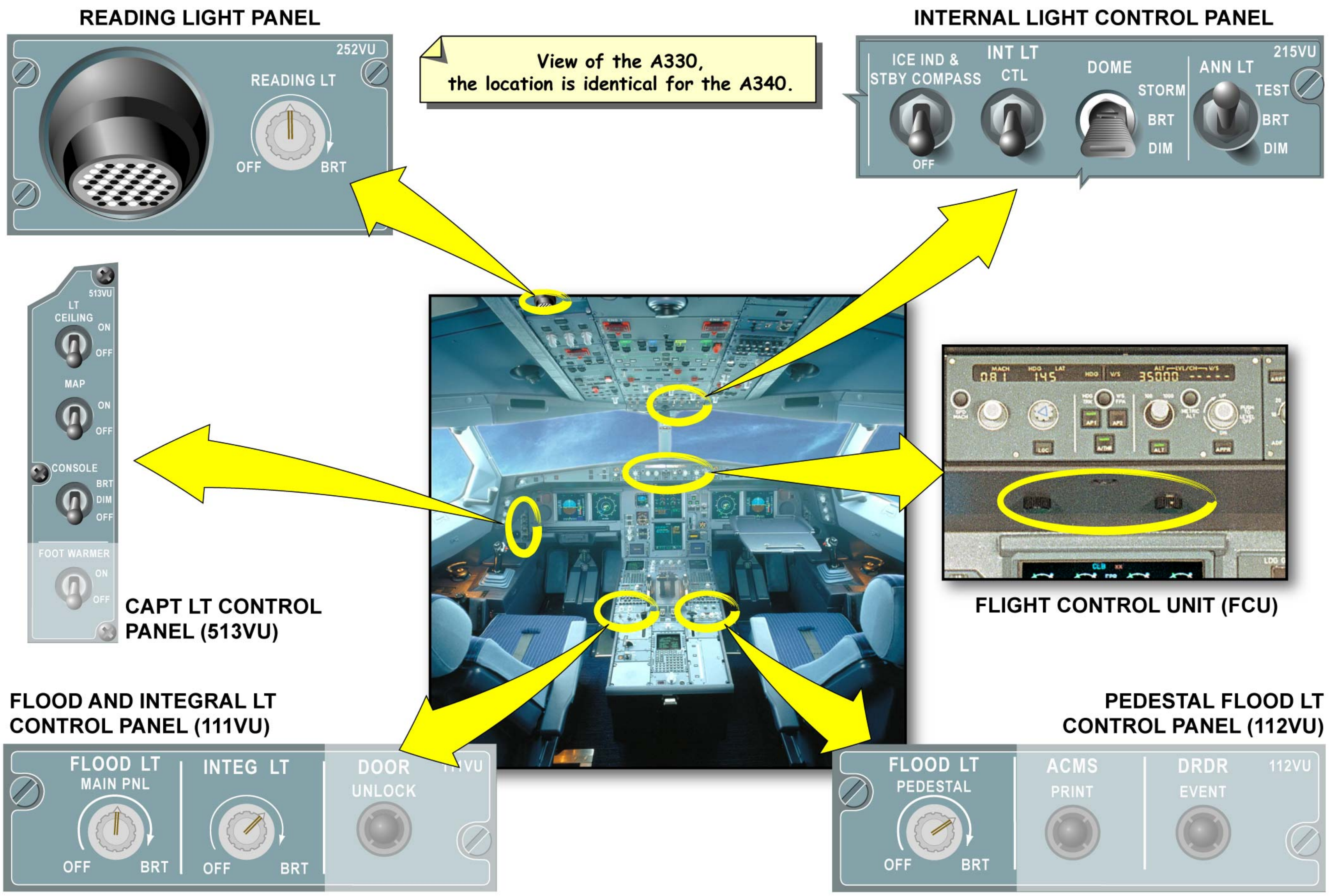
33 LIGHTS SYSTEM PRESENTATION (1)

COCKPIT LIGHTS (continued)

CONTROLS

The cockpit panels and instrument lighting controls are located on the pedestal, overhead panel, main instrument panel and underneath the glareshield. The CAPT and F/O reading lights contain a potentiometer for brightness control. The internal light panel contains the controls for the overhead panel integral lighting, standby compass integral light, the dome lights, and the annunciator lights. Two potentiometers underneath the glareshield control the integral lighting of the glareshield and the Flight Control Unit (FCU) displays. The FLOOD LighT potentiometers control the flood lights of their respective areas and the INTEGral LT potentiometer, the main panel and pedestal lighting. The side console light controls are on the left and right hand sides of the main instrument panel.



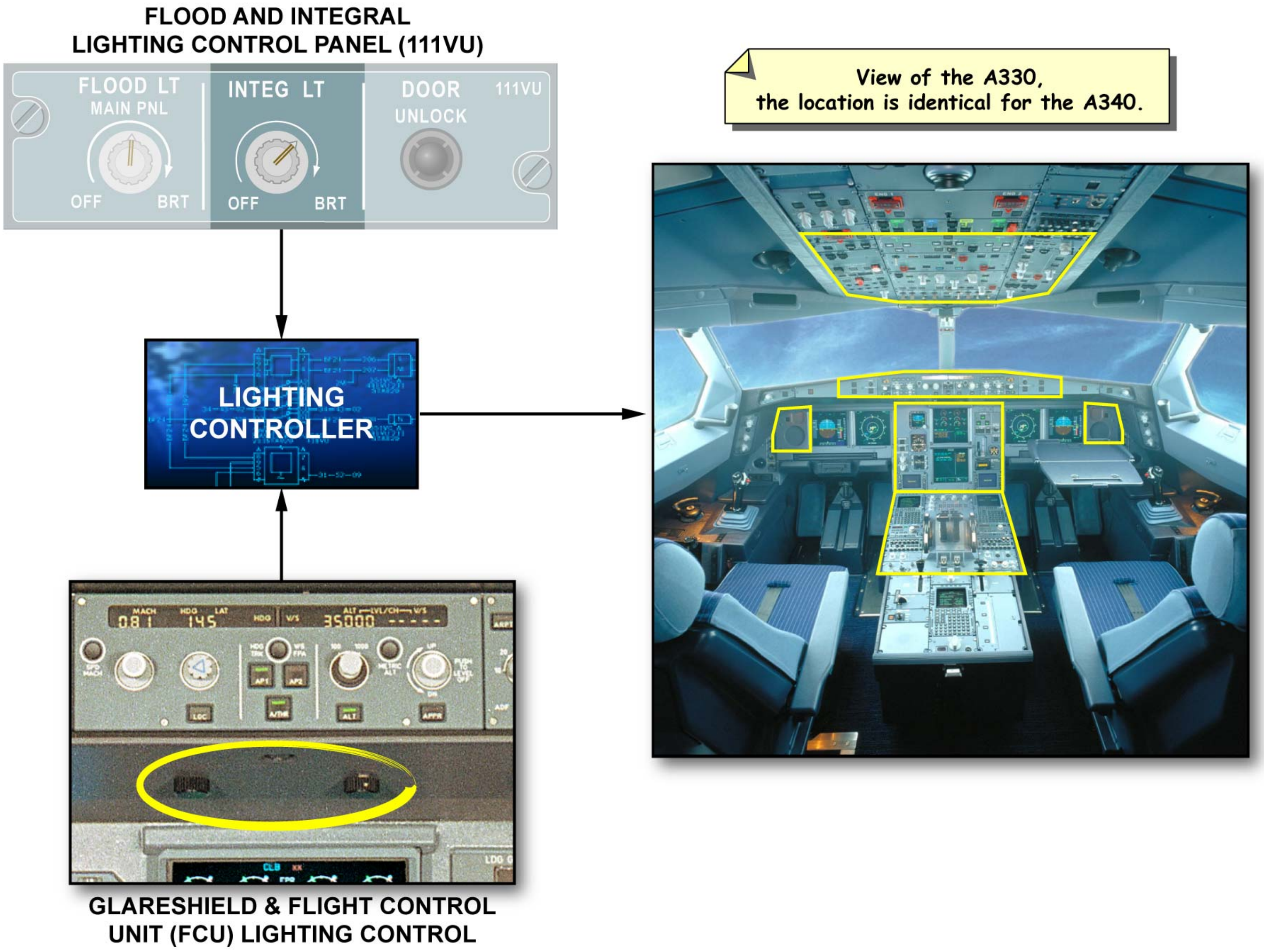
COCKPIT LIGHTS - CONTROLS

33 LIGHTS SYSTEM PRESENTATION (1)

COCKPIT LIGHTS (continued)

INSTRUMENTS AND PANELS INTEGRATED LIGHTING

The instruments and panels integrated lighting brightness is variable for night flights or flight in stormy conditions. The integral lighting brightness of the overhead panel, CAPT and F/O main instrument panels, is controlled by the integral light potentiometer located on the center pedestal via a lighting controller. The adjustment of the integral lighting brightness of the glareshield and FCU is controlled, via the lighting controller, by rotary potentiometers located underneath the glareshield.



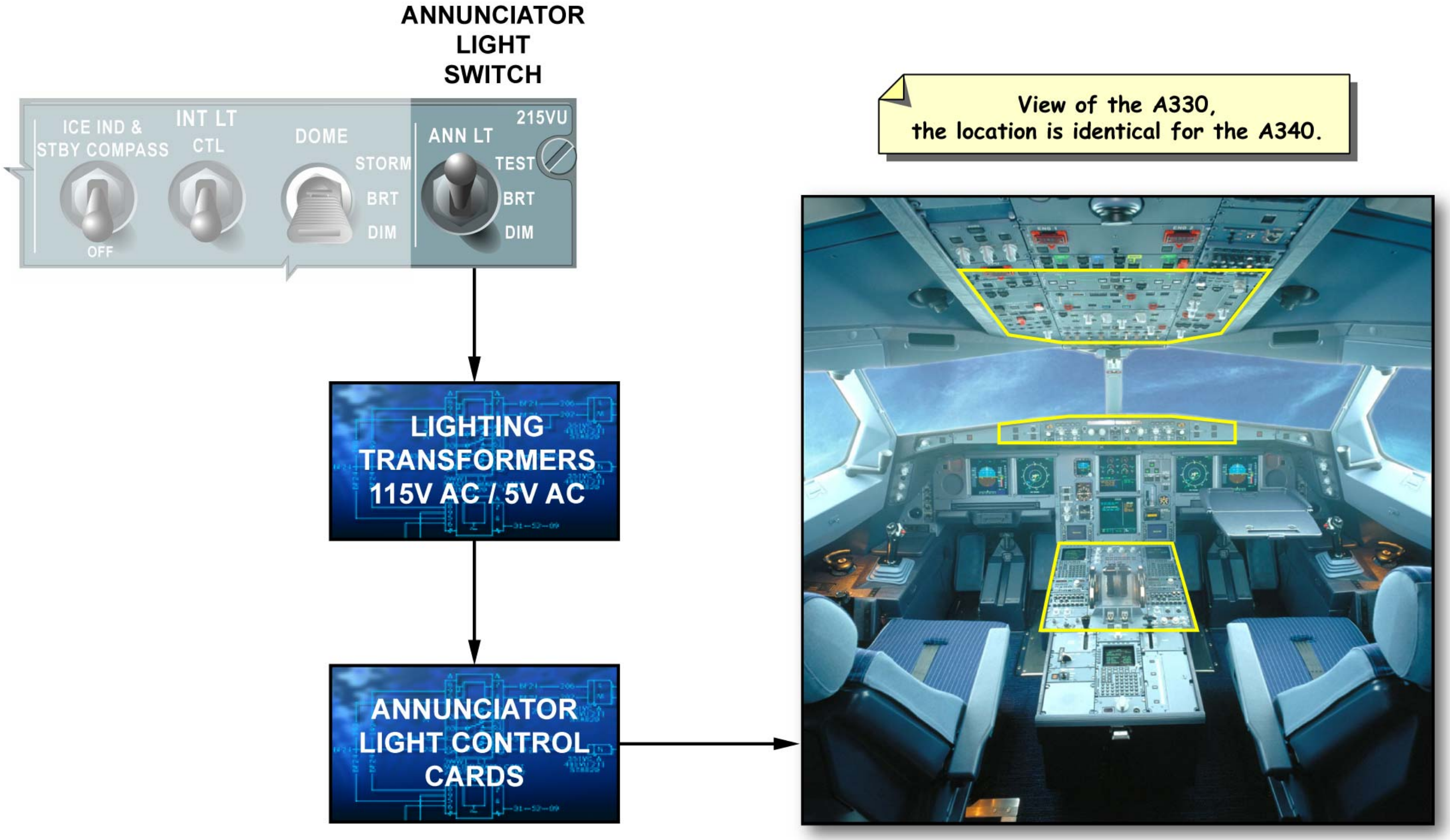
COCKPIT LIGHTS - INSTRUMENTS AND PANELS INTEGRATED LIGHTING

33 LIGHTS SYSTEM PRESENTATION (1)

COCKPIT LIGHTS (continued)

ANNUNCIATOR LIGHT TEST

The dimming of all annunciators and P/BSWs located on the overhead panel, glareshield and pedestal, is possible by using the "TEST-BRighT-DIM" control switch installed on the overhead panel.
The ANNunciator LT TEST function is used for checking all lights.
Four identical transformers distributed through control cards to the P/B lamps, supply the correct voltage.



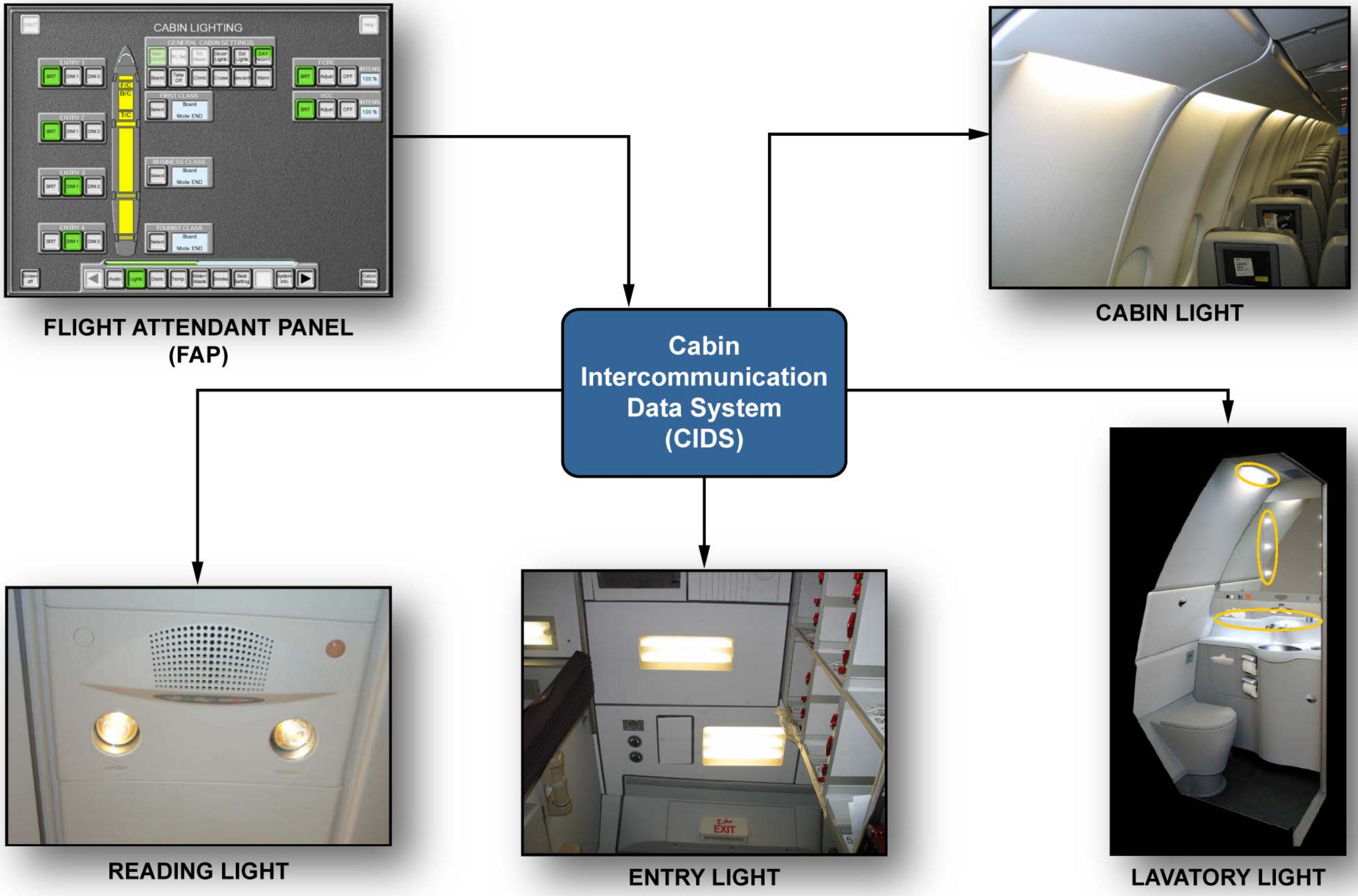
COCKPIT LIGHTS - ANNUNCIATOR LIGHT TEST

33 LIGHTS SYSTEM PRESENTATION (1)

CABIN LIGHTS

GENERAL

The cabin lights are controlled by the Cabin Intercommunication Data System (CIDS) through the Flight Attendant Panel (FAP). The CIDS fulfills the control and monitoring of:
- the lighting of general or specific cabin lighting and entrances, according to established light scenarios designed in the CIDS,
- the normal or automatic lighting of the lavatories.



CABIN LIGHTS - GENERAL

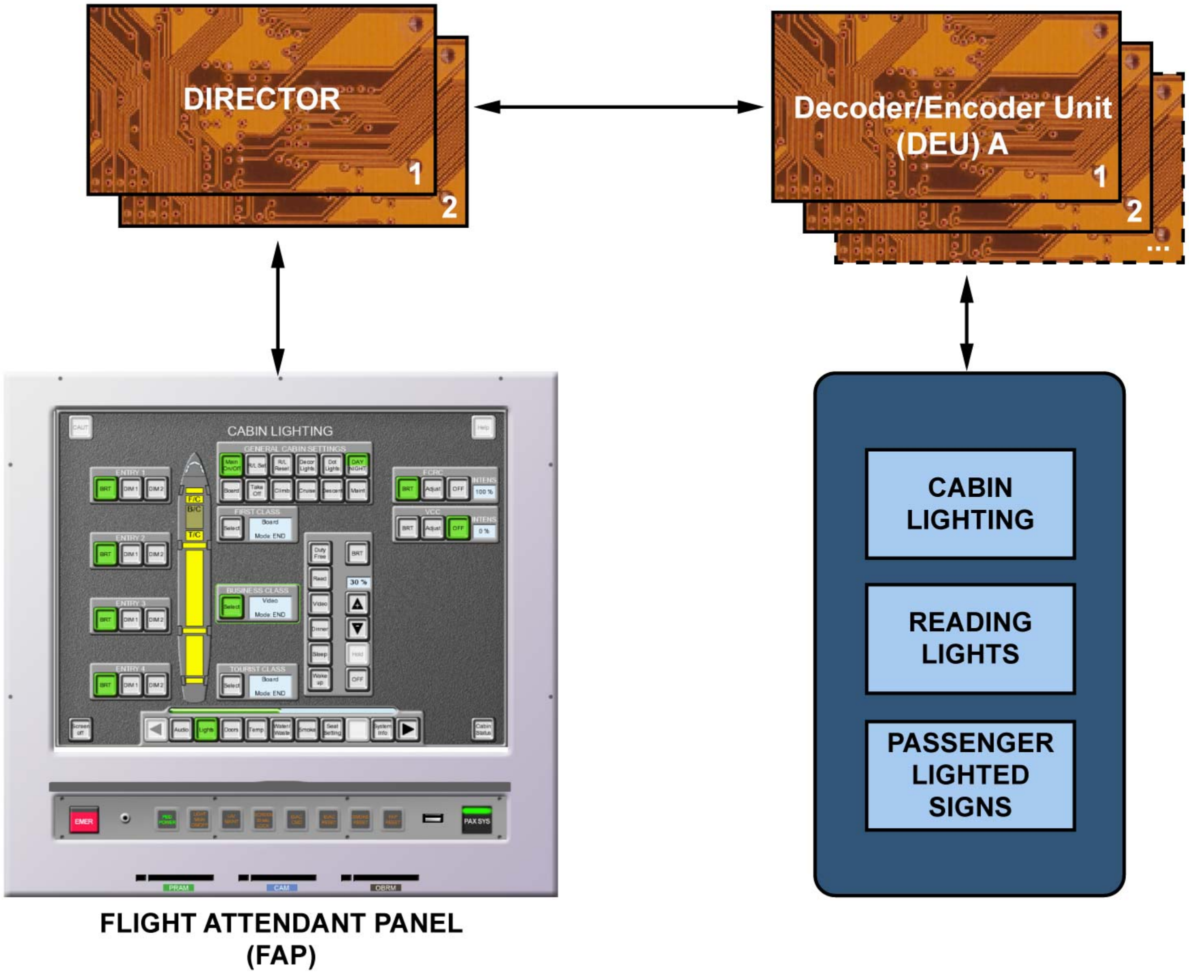
G6B08031 - G10T4T0 - FM33P8000000001

33 LIGHTS SYSTEM PRESENTATION (1)

CABIN LIGHTS (continued)

CABIN LIGHTS THROUGH CIDS

The CIDS includes two DIRectors, the FAP and the Decoder/Encoder Units (DEUs). The CABIN LIGHTING page on the FAP is used for the control of all the cabin lighting. The touch screen of the FAP controls and indicates the status of the CIDS. Cabin Assignment Module (CAM), On Board Replaceable Module (OBRM) and Prerecorded Announcement and Music (PRAM) in flash card format are integrated within the FAP.



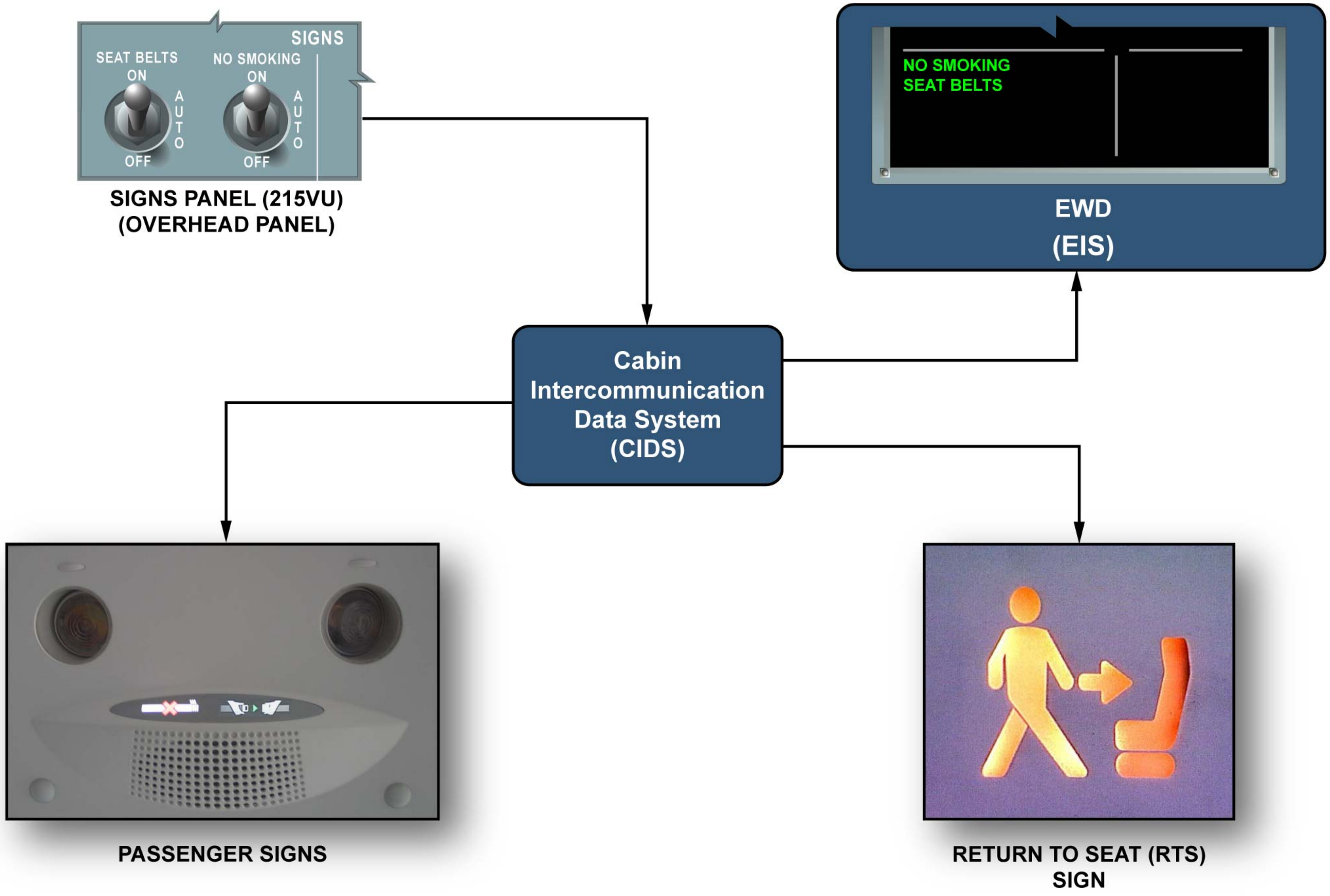
CABIN LIGHTS - CABIN LIGHTS THROUGH CIDS

33 LIGHTS SYSTEM PRESENTATION (1)

CABIN LIGHTS (continued)

CABIN SIGNS

The CIDS controls the passenger signs lighting. The SIGNS switches, located in the cockpit overhead panel, can be selected to AUTO or ON. In AUTO position, the cabin signs come on according to operational events, e.g. slat position or landing gear position.



CABIN LIGHTS - CABIN SIGNS

G6B08031 - G10T4T0 - FM33P8000000001

33 LIGHTS SYSTEM PRESENTATION (1)

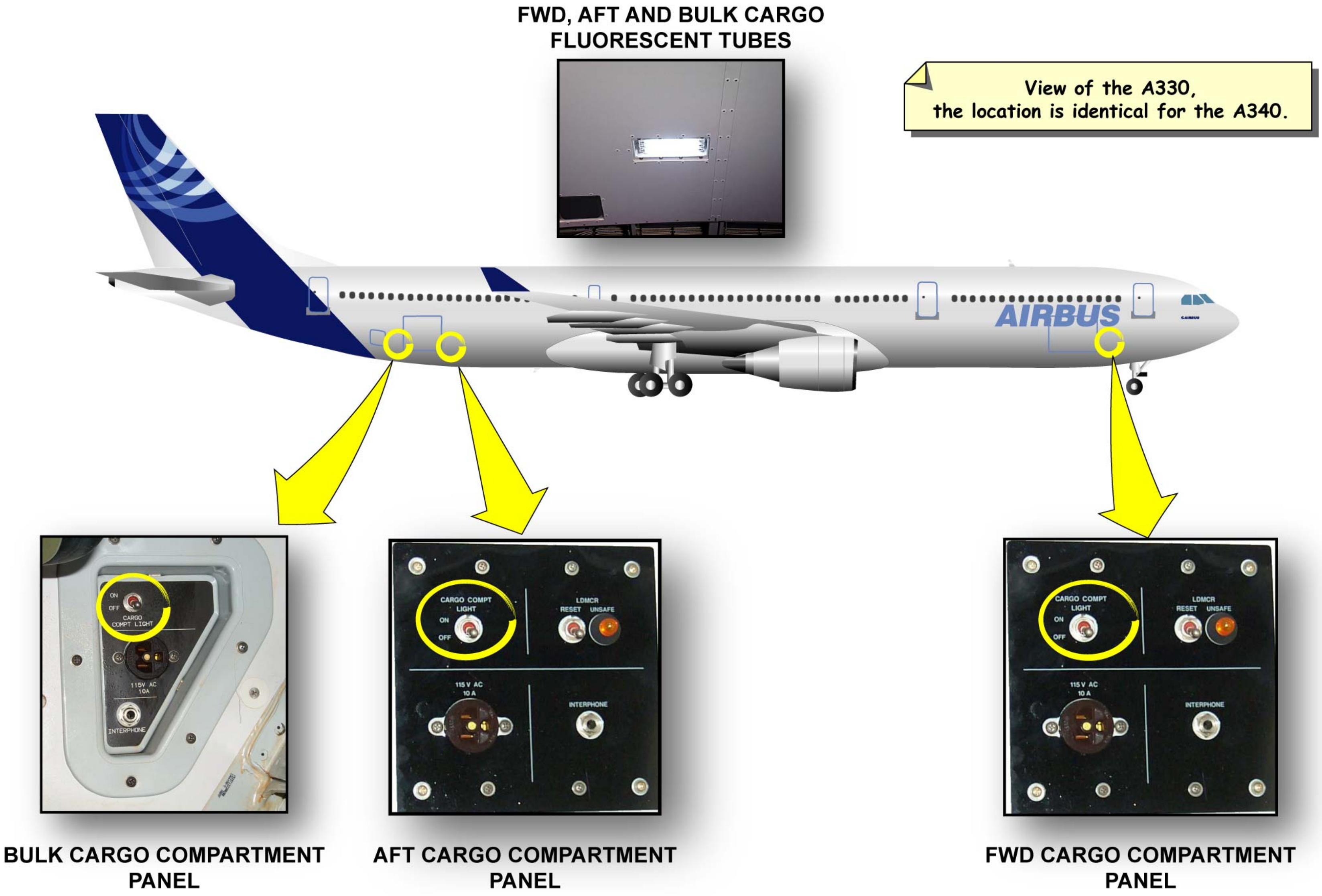
CARGO COMPARTMENTS

GENERAL

Fully integrated lighting is installed for the FWD, AFT and BULK cargo compartments.

CONTROL

FWD, AFT and BULK cargo compartments fluorescent tubes are separately controlled by a toggle switch located inside each cargo compartment near the door on the RH side.



CARGO COMPARTMENTS - GENERAL & CONTROL

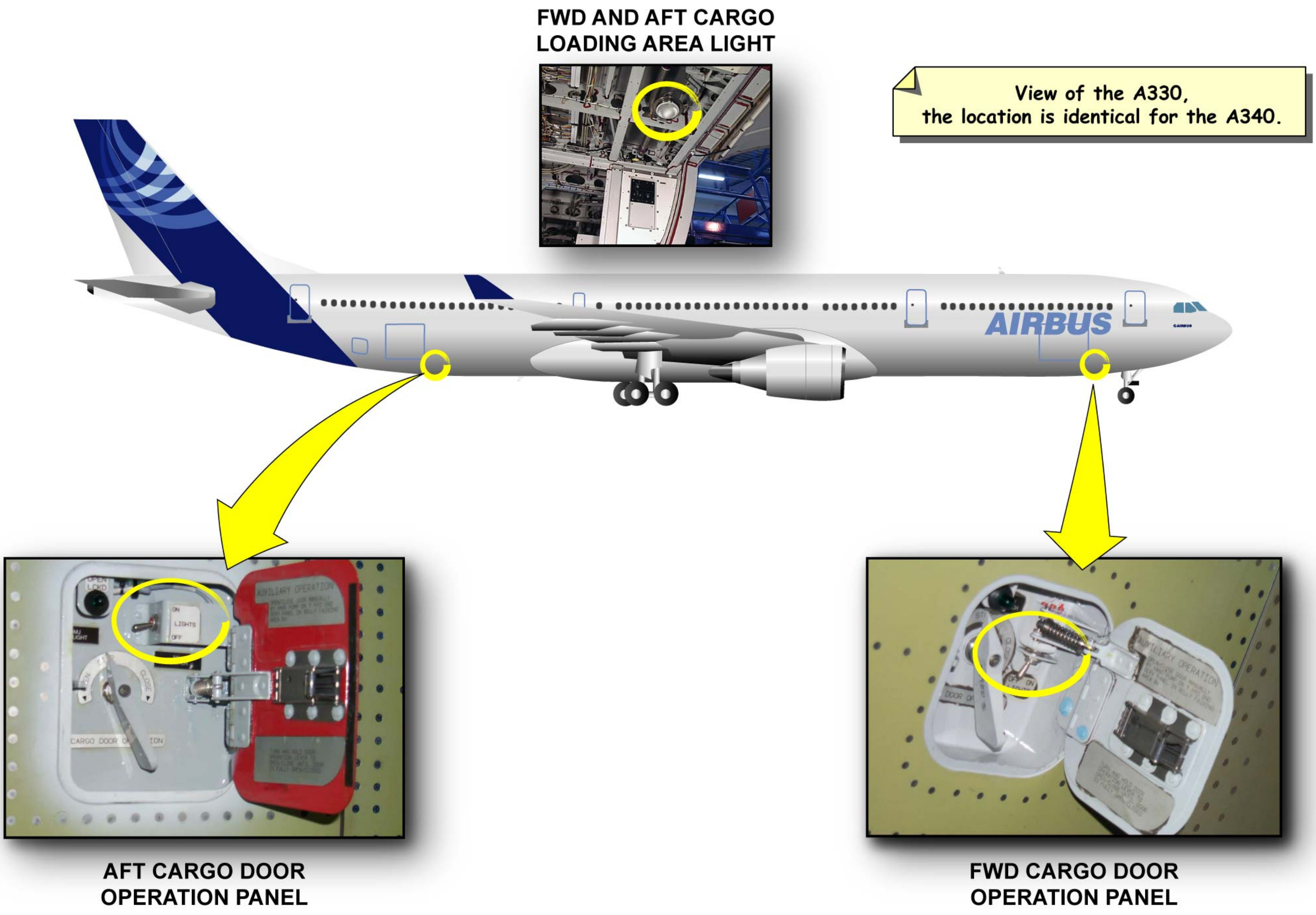
33 LIGHTS SYSTEM PRESENTATION (1)

CARGO COMPARTMENTS (continued)

OPERATION PANELS

The loading areas of the FWD and AFT cargo compartments are lit by loading area lights. These are controlled by a toggle switch located outside the cargo compartments on the RH side in the door operation panel.

G6B08031 - G10T4T0 - FM33P8000000001

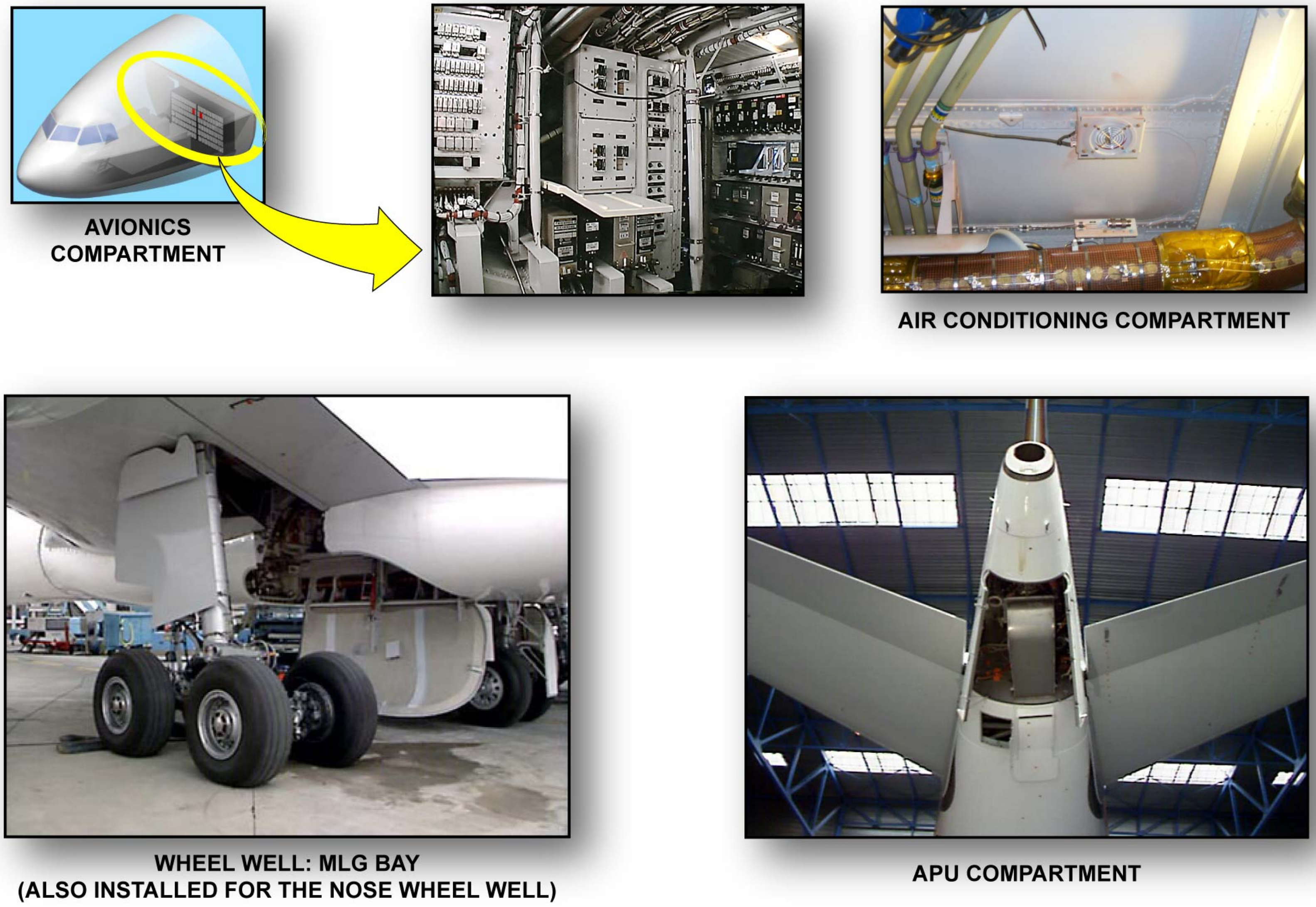


CARGO COMPARTMENTS - OPERATION PANELS

33 LIGHTS SYSTEM PRESENTATION (1)

SERVICE COMPARTMENTS LIGHTING

The service compartments are the wheel well compartments, air conditioning bay, avionics and APU compartments. They have manually controlled lights with adjacent switches. Some electrical outlets located in different compartments are installed for the use of portable maintenance lamps.



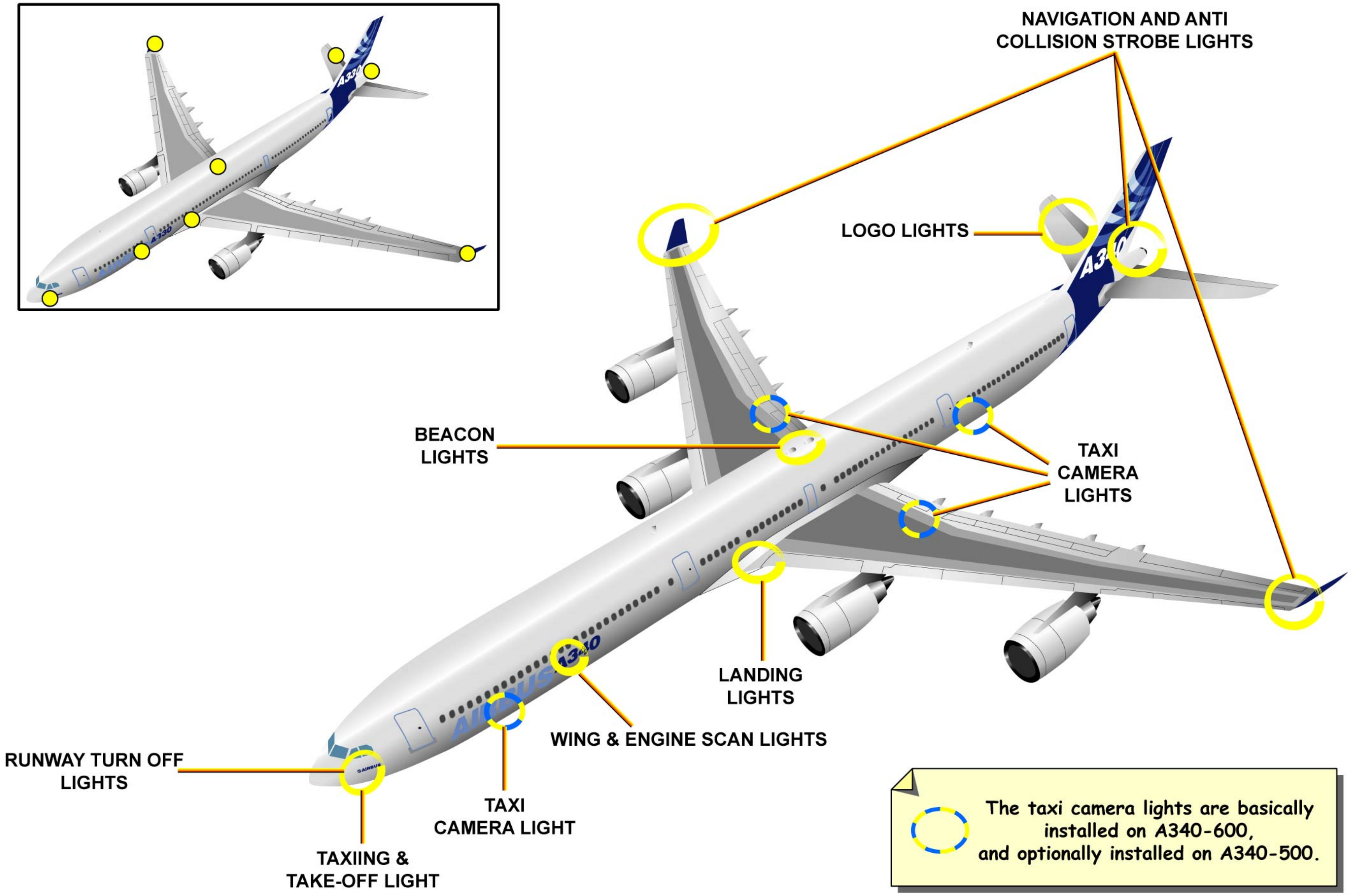
SERVICE COMPARTMENTS LIGHTING

33 LIGHTS SYSTEM PRESENTATION (1)

EXTERIOR LIGHTS

GENERAL

The exterior lighting system fulfills various functions such as:
- navigation and logo lights,
- runway turnoff lights,
- taxiing and take-off lights,
- landing lights,
- anti-collision strobe and beacon lights,
- wing and engine scan lights,x
- taxi camera lights if installed (A340-600 and optional on A340-500).



EXTERIOR LIGHTS - GENERAL

33 LIGHTS SYSTEM PRESENTATION (1)

EXTERIOR LIGHTS (continued)

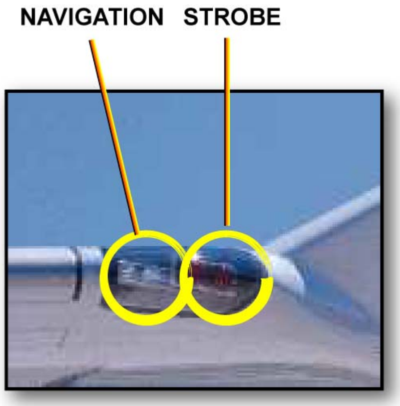
COMPONENT LOCATION

The navigation lights are used to give a visual indication of the position of the A/C and its direction of flight. The NAVigation & LOGO toggle switch controls this function. Two lights are installed on each side of the THS to light the airline logo. They are controlled ON by the NAV & LOGO toggle switch in position 1 or 2 plus the MLG compressed or flaps extended.
Two fixed-position runway turnoff lights, installed on the NLG, light the lateral areas of the runway. They are controlled by the RunWaY TURN OFF & CAMERA toggle switch and operate only when the L/G is downlocked. Two take-off and taxi lights are installed on the NLG in a fixed position. They are simultaneously controlled by the NOSE toggle switch and operate when the NLG is locked in the down position. A fixed landing light is installed in each wing root leading edge. They are simultaneously controlled by the LAND switch.
Two red flashing beacon lights are installed, one on the lower and one on the upper fuselage along the aircraft centerline. They are controlled by the BEACON switch. One white flashing strobe light is installed in each wing tip leading edge and one in the tail cone. They are simultaneously controlled by the STROBE toggle switch.

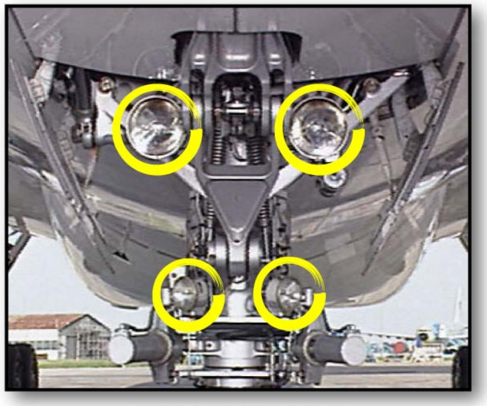
NOTE: When anti-collision strobe lights and anti-collision beacon lights flash, a timing system controls them in order to flash alternately in a synchronized fashion.

In the AUTO position, the strobe lights flash when the shock absorbers are not compressed. In the OFF position, during flight, the STROBE LT OFF memo is displayed on the EWD.
Fixed-position wing and engine scan lights are installed on each side of the fuselage to let the flight crew visually detect ice on the engine air intakes and leading edges. These lights are controlled by the WINGS switch. The wing and engine scan lights can be switched ON, on the ground for maintenance functions, for a limited time only (2 hours maximum).
Two halogen taxi camera lights are installed under the fuselage to light the taxiway in the vicinity of the NLG. Four halogen taxi camera lights are installed in the lower fuselage to light the taxiway outboard of the MLG. Two halogen taxi cameras lights are installed in the rear lower wing skin to light the outer area of the MLG. All lights are controlled by the RWY TURN OFF & CAMERA light control switch.

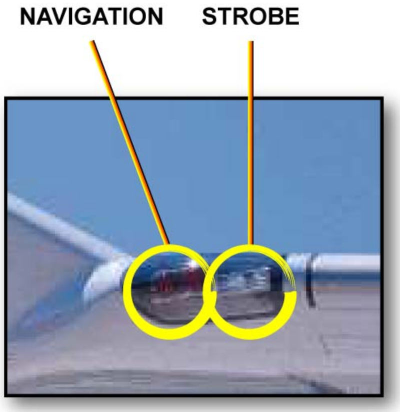
NOTE: The Taxiing Aid Camera System (TACS) is basic for the A340-600 whereas it is an option for the A340-500, and not available for the classic A330/A340.



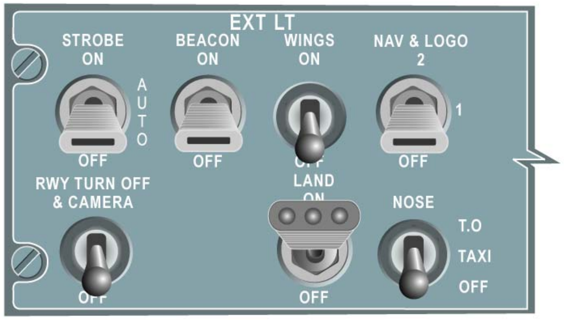
LH NAVIGATION
&
STROBE LIGHTS



TAXI, TAKE-OFF
&
RWY TURN OFF LIGHTS



RH NAVIGATION
&
STROBE LIGHTS

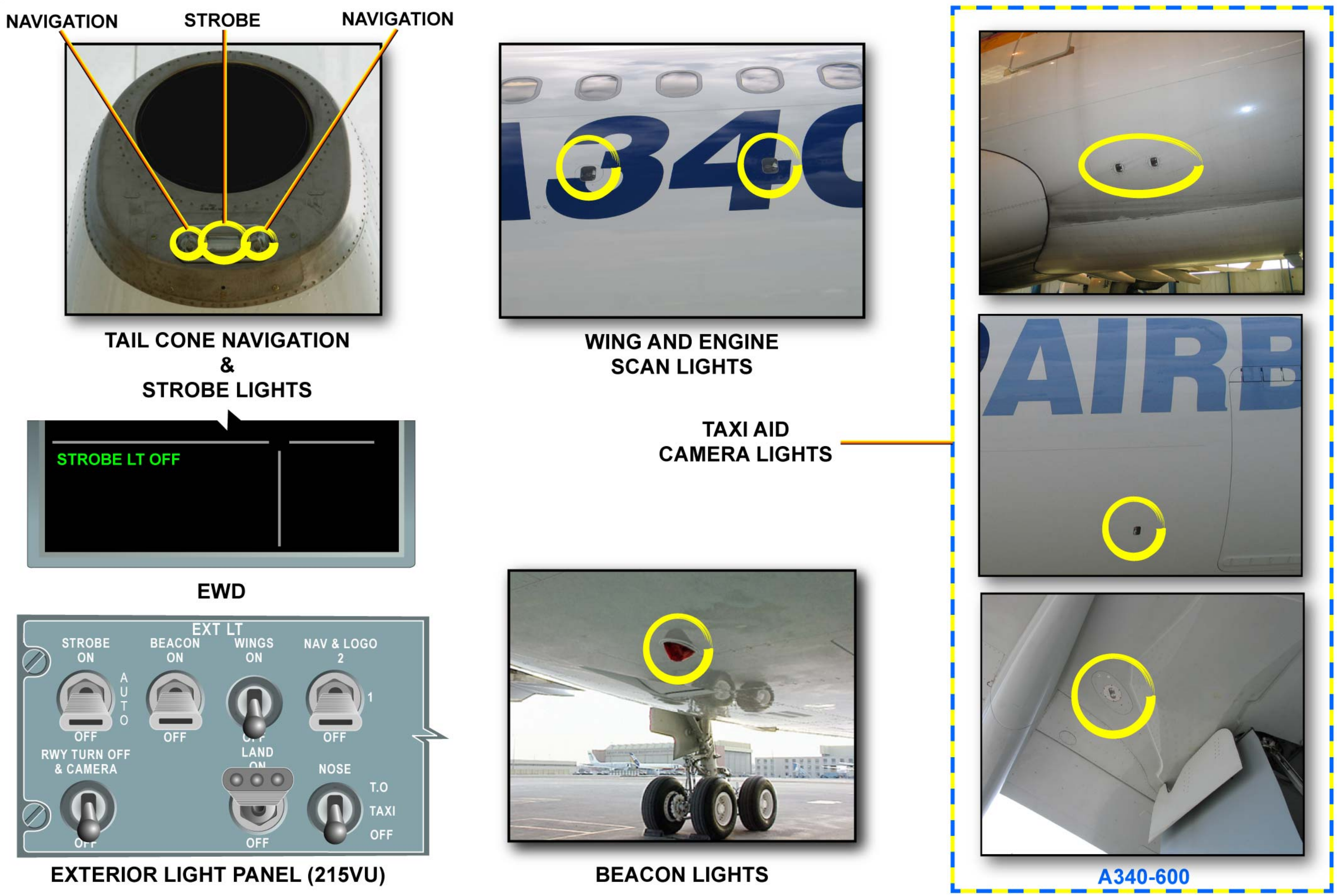


EXTERIOR LIGHT PANEL (215VU)

LOGO LIGHT

LANDING LIGHT

EXTERIOR LIGHTS - COMPONENT LOCATION



EXTERIOR LIGHTS - COMPONENT LOCATION

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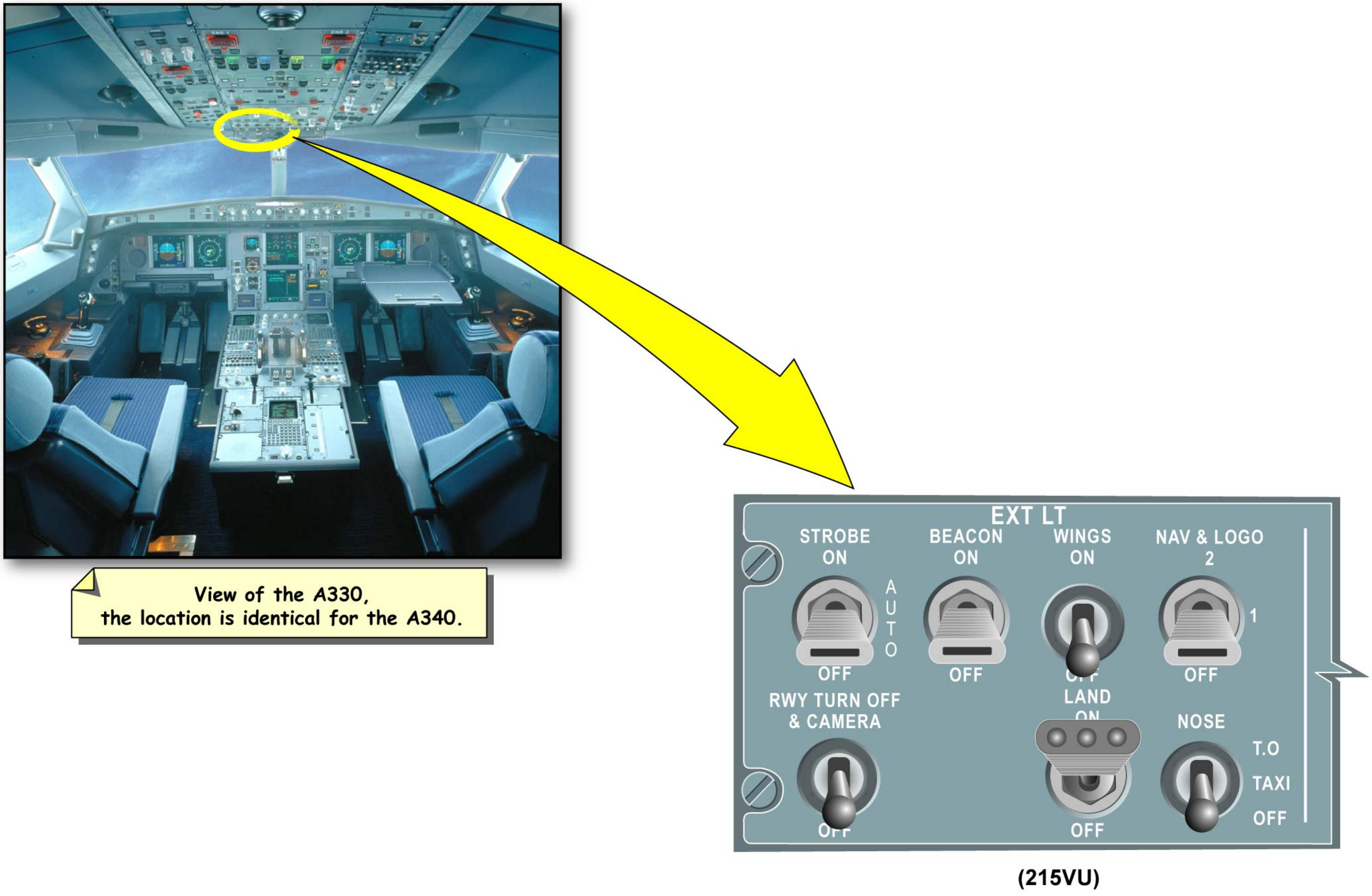
33 LIGHTS SYSTEM PRESENTATION (1)

EXTERIOR LIGHTS (continued)

CONTROLS

The exterior lights are controlled by the EXTerior LT panel located on the cockpit overhead panel.



EXTERIOR LIGHTS - CONTROLS

33 LIGHTS SYSTEM PRESENTATION (1)

EMERGENCY LIGHTS

GENERAL

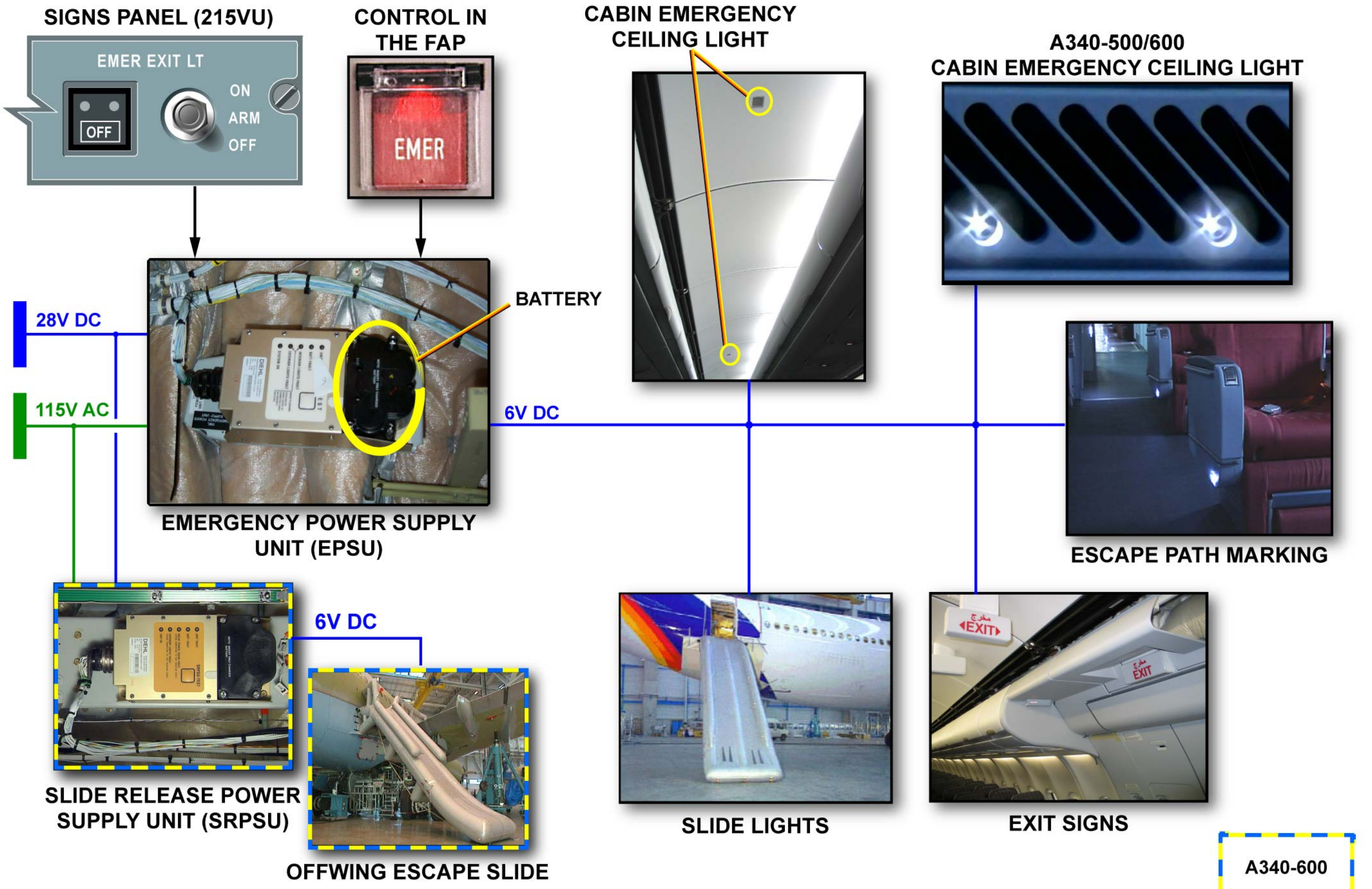
Emergency lights in the cabin include emergency exit signs, ceiling emergency lights and escape path lighting system. The emergency lights are supplied by several Emergency Power Supply Units (EPSUs).

NOTE: Ceiling lights, Floor Proximity Emergency Escape Path Marking System (FPEEPMS) lights, cabin door and exit marking are Light Emitting Diodes (LEDs).

CABIN EMERGENCY LIGHTING

The cabin emergency lighting system comes on according to the flight phase or operational events (automatic mode) or by manually setting the selectors to ON. These selectors are the toggle switches in the cockpit and the EMERgency P/B on the FAP in the cabin. The EPSUs control and monitor the emergency lighting system entirely in accordance with the mode of system activation. The system is used during the evacuation of the aircraft. For the A340-600, the offwing escape-slide system is installed at the overwing emergency-exits, and is electrically operated. Deployment of the escape-slide is automatic when the door is opened with the escape-slide control handle (referred to as emergency control-handle) set in the ARMED position. The battery bus bar supplies 28V DC power to operate the electrical escape-slide release system via the Slide-Release Power-Supply Unit (SRPSU). The SRPSU is located above the ceiling panels near the overwing emergency door on the left hand side.

NOTE: The SRPSU and its related slide are only installed on the A340-600.

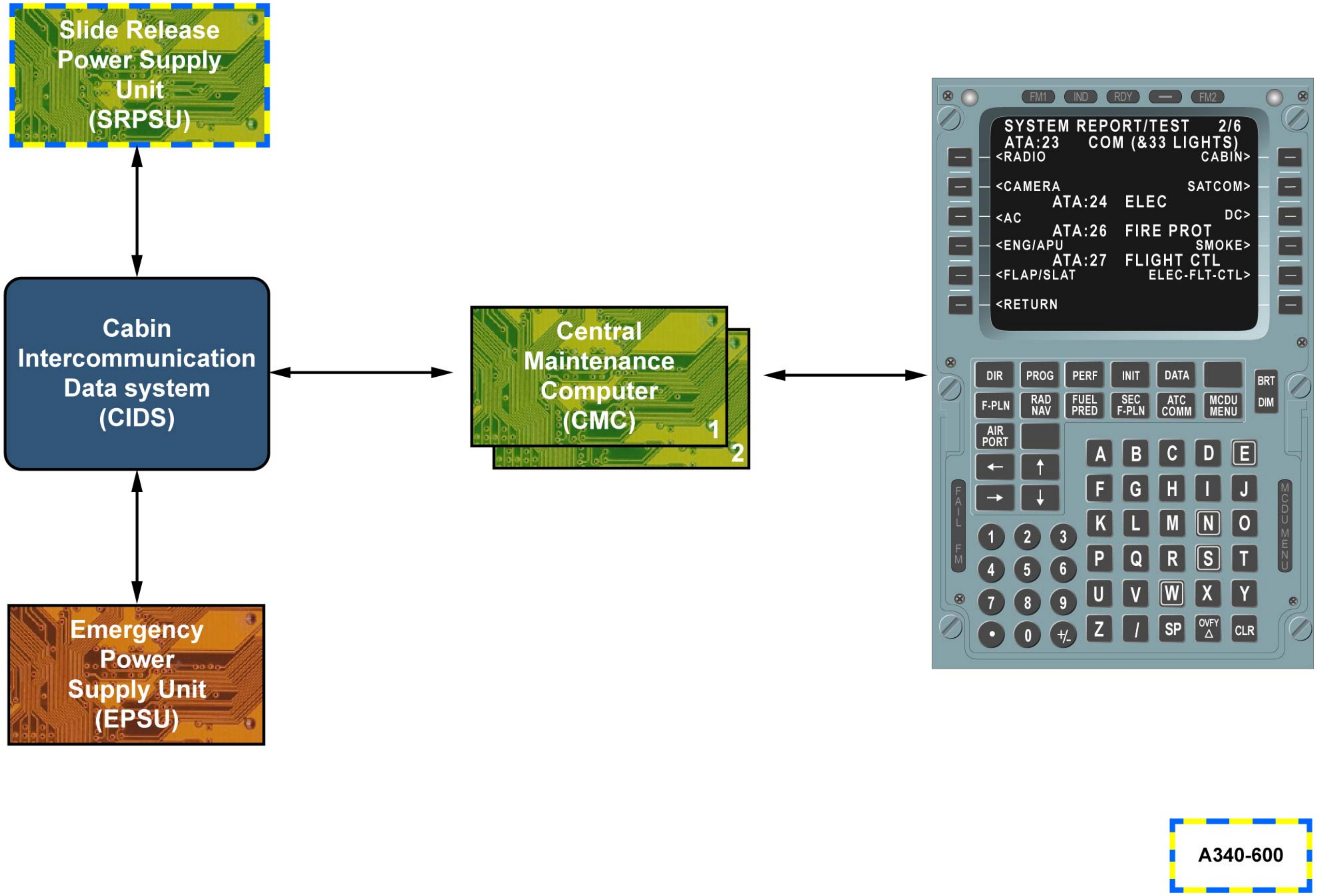


EMERGENCY LIGHTS - GENERAL & CABIN EMERGENCY LIGHTING

33 LIGHTS SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

The testing of the emergency lighting system can be done either through the Central Maintenance System (CMS), via the use of the MCDU, or individually (EPSU, SRPSU and related lights) via the test P/B and the control LEDs. When tested through the CMS, the emergency lighting system is completely tested, using the CIDS as the main monitoring control system device.



MAINTENANCE/TEST FACILITIES

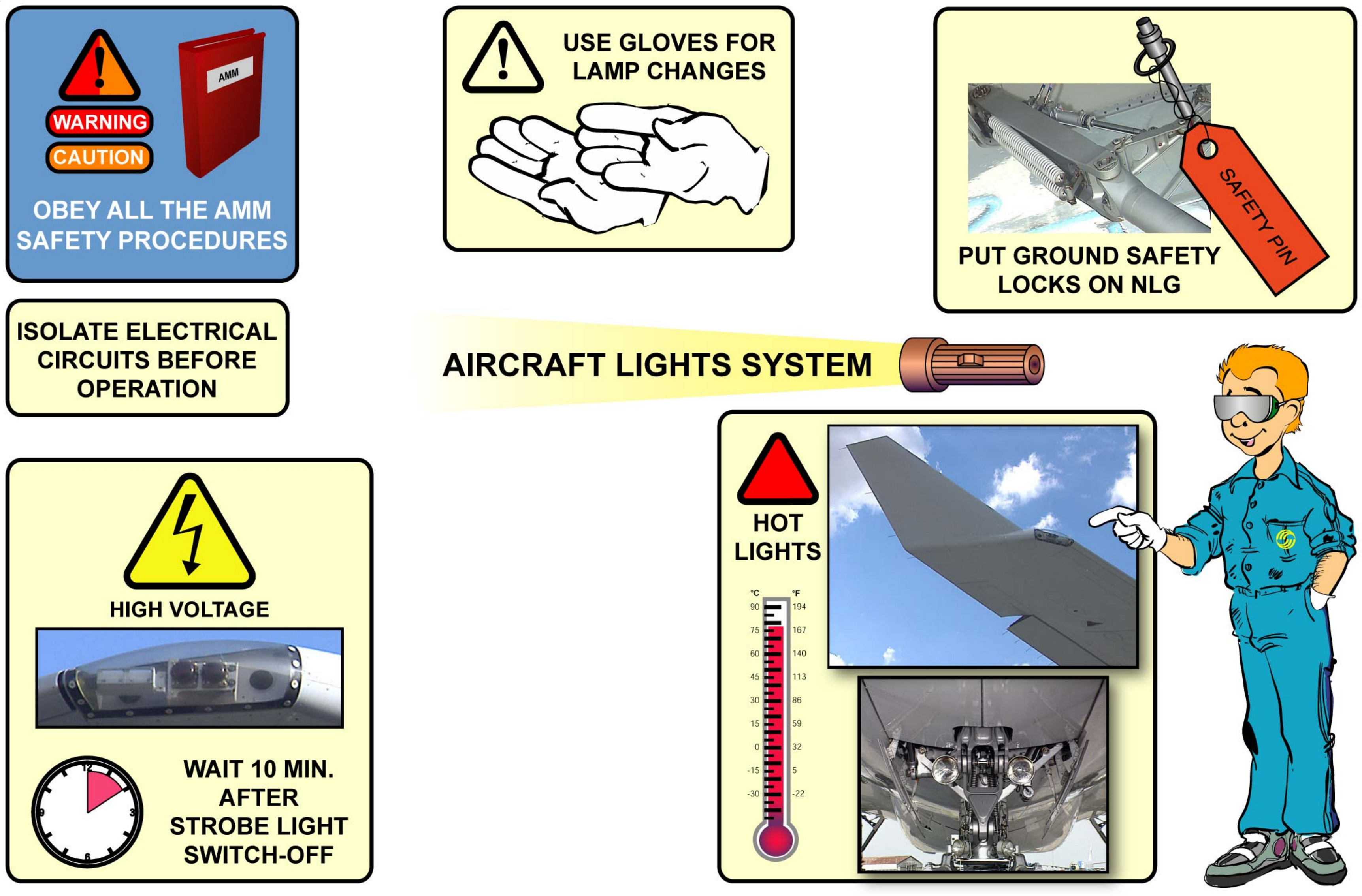
G6B08031 - G10T4T0 - FM33P8000000001

33 LIGHTS SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

When you work on the lights system, make sure that you obey all the AMM safety procedures. This will prevent injury to persons and/or damage to the A/C. Here is an overview of main safety precautions relative to the lights system:

- isolate the electrical circuits from the related equipment and the environment to prevent injury to persons and/or A/C damage,
- when you change a lamp, do not touch the glass with your fingers. The oils from your skin will quickly cause deterioration of the lamp. If you accidentally touch the lamp glass, clean it with a lint-free cloth.
- make sure that the ground safety locks are correctly installed on the nose gear and doors. This prevents unwanted movement of the NLG and NLG doors,
- be careful when you change the strobe or taxi/take-off lamps, they stay hot several minutes after switch-off,
- do not look directly at some lights without eyes protection. Their intensity can be high enough to cause permanent damage to your eyes,
- be careful when you work on the powered strobe light. Wait ten minutes after de-energization of the electrical circuits, as some components have dangerous voltages, which can kill or injure you.



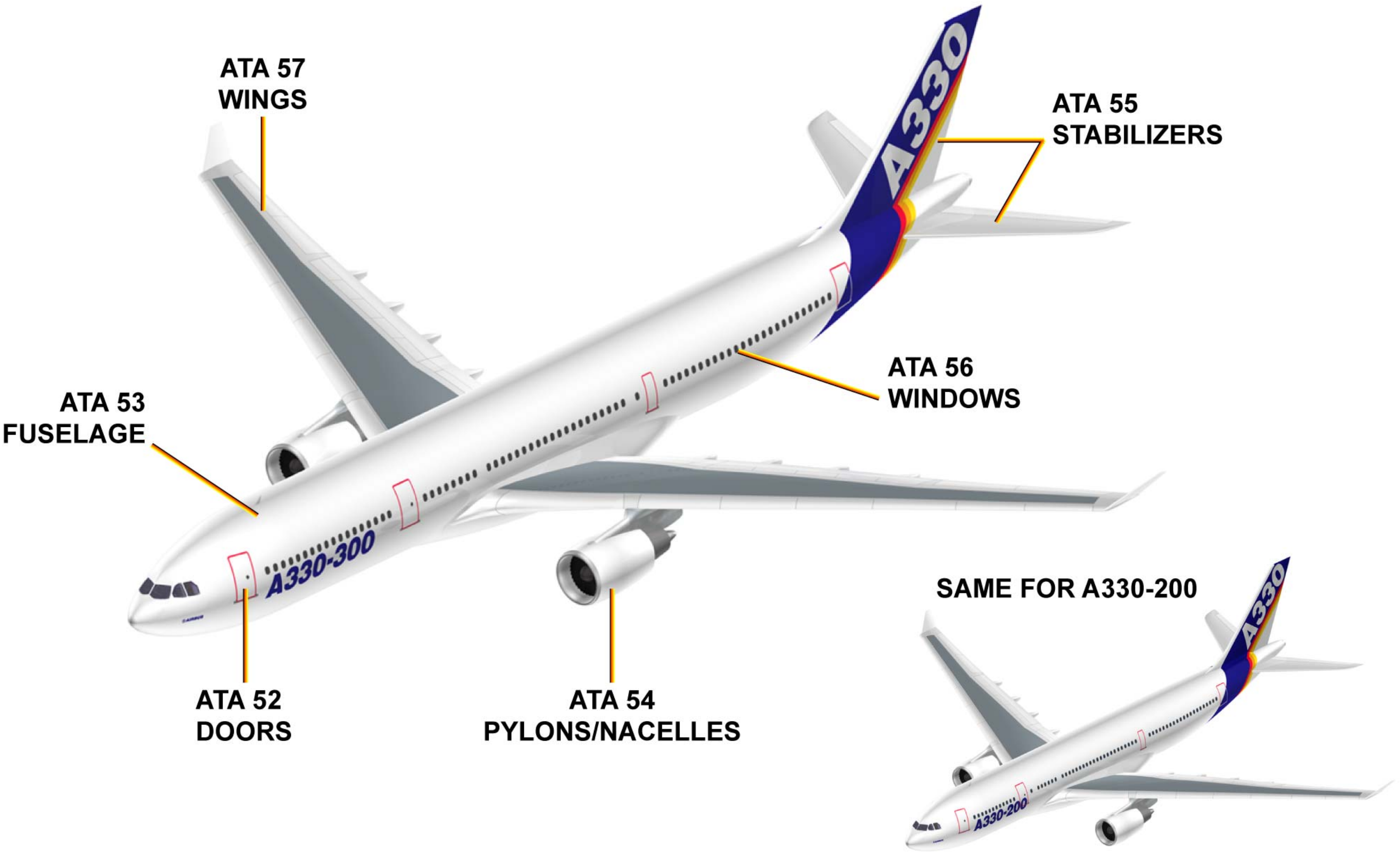
SAFETY PRECAUTIONS

51 STRUCTURE PRESENTATION (1)

STRUCTURE BREAKDOWN

The aircraft structure is broken down into six ATA (Air Transport Association of America) chapters:
- ATA 52 - doors,
- ATA 53 - fuselage,
- ATA 54 - pylons/nacelles,
- ATA 55 - stabilizers,
- ATA 56 - windows,
- ATA 57 - wings.

This breakdown is the same for the A330-200.

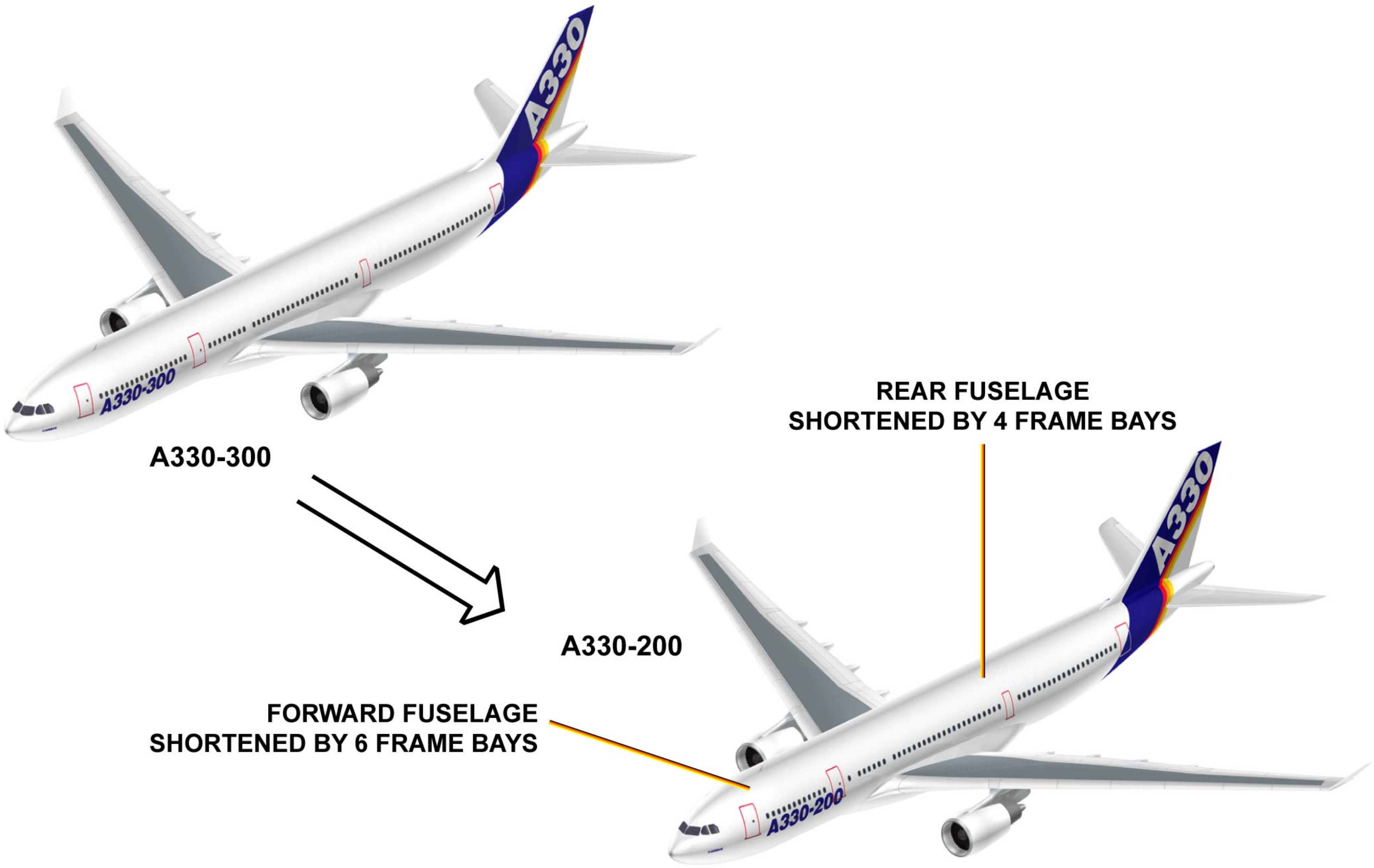


STRUCTURE BREAKDOWN

51 STRUCTURE PRESENTATION (1)

MAJOR STRUCTURAL DIFFERENCES

The A330-200 fuselage is ten frame bays shorter than the A330-300 fuselage (six frame bays at the forward fuselage, four frame bays at the rear fuselage).



MAJOR STRUCTURAL DIFFERENCES

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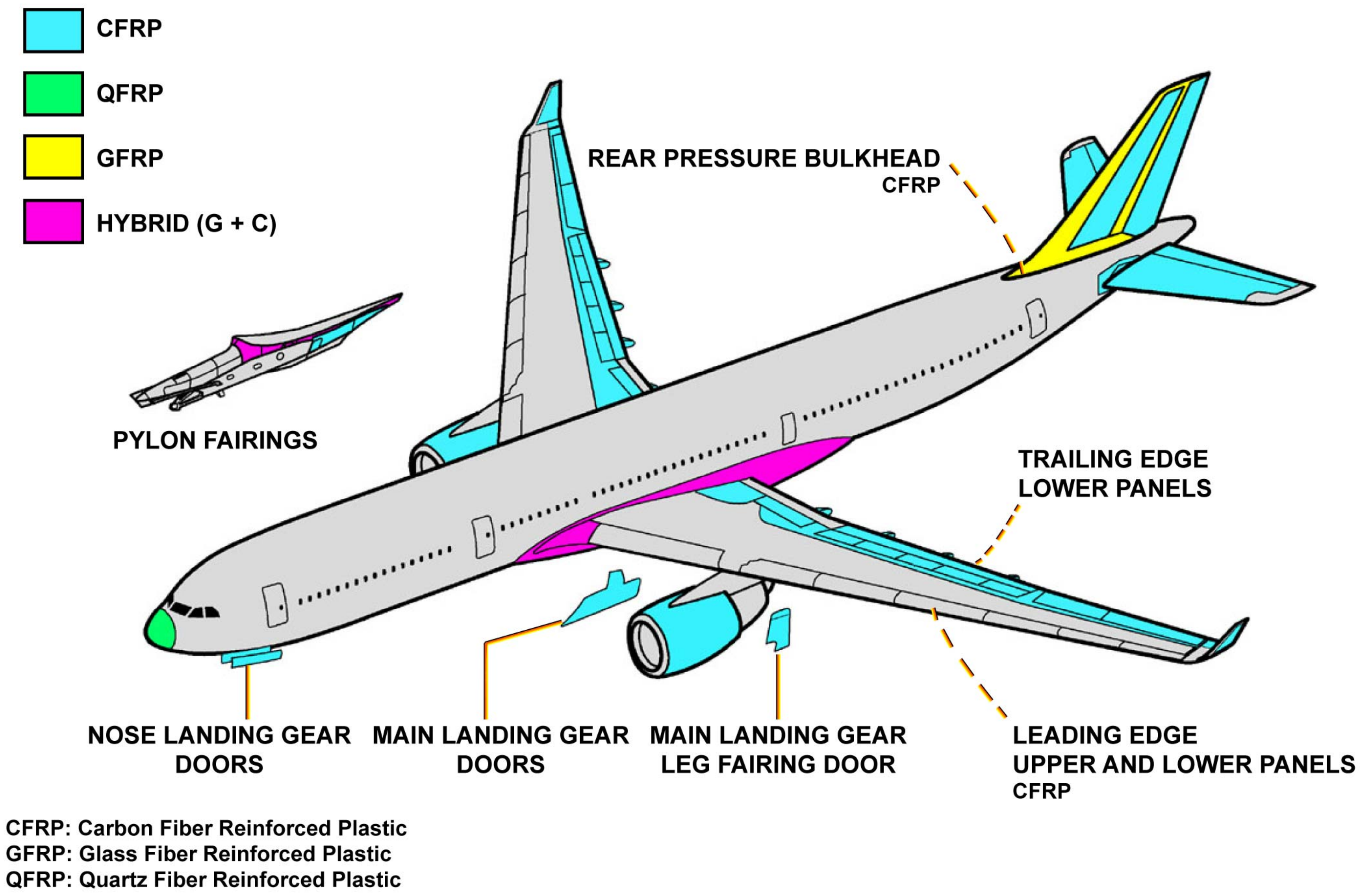
51 STRUCTURE PRESENTATION (1)

COMPOSITE STRUCTURE LOCATION

The illustration shows the main application of composite materials on the A330.



COMPOSITE STRUCTURE LOCATION

G6B08031 - G10T4T0 - FM51P3000000001

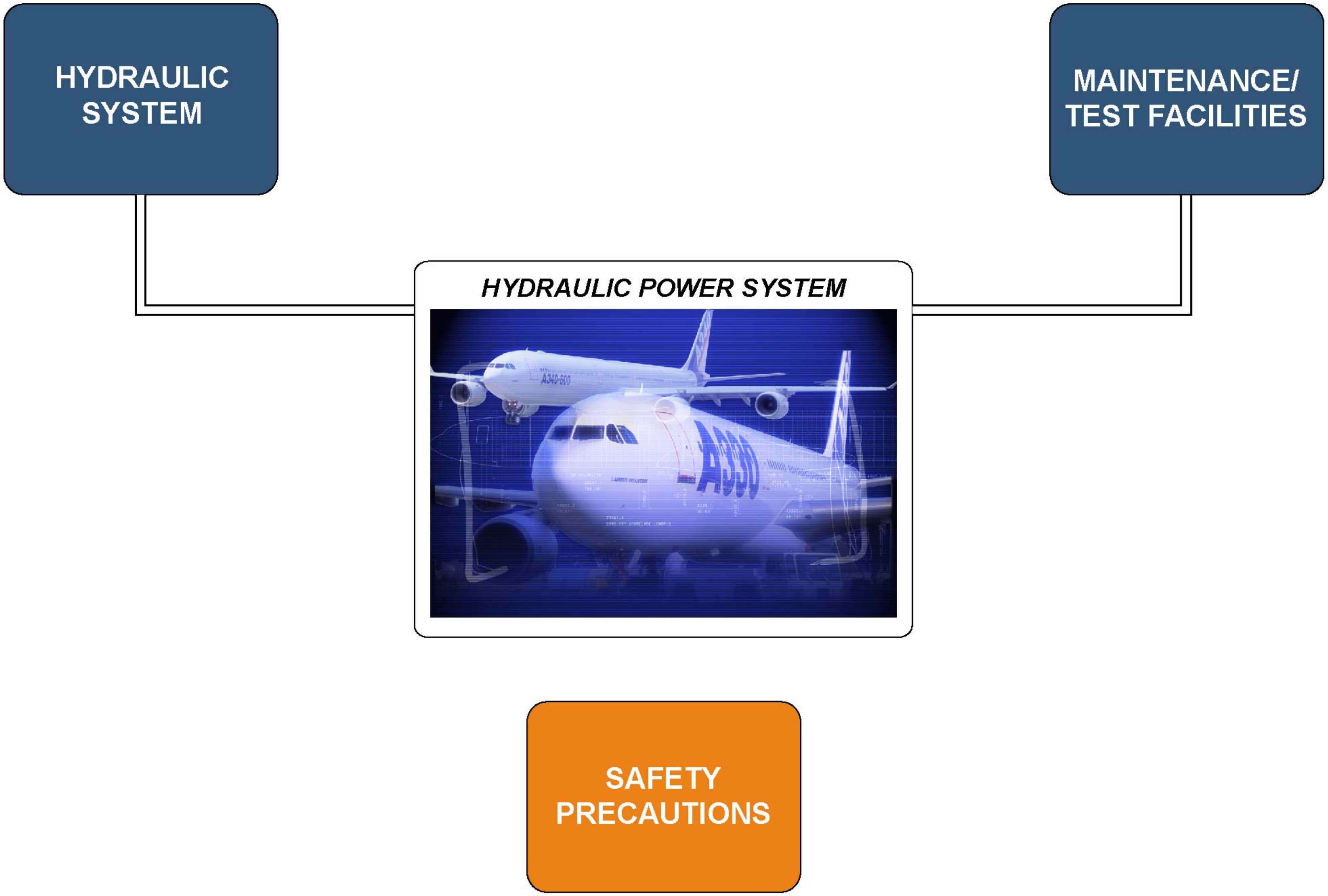
29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

SYSTEM INTRODUCTION

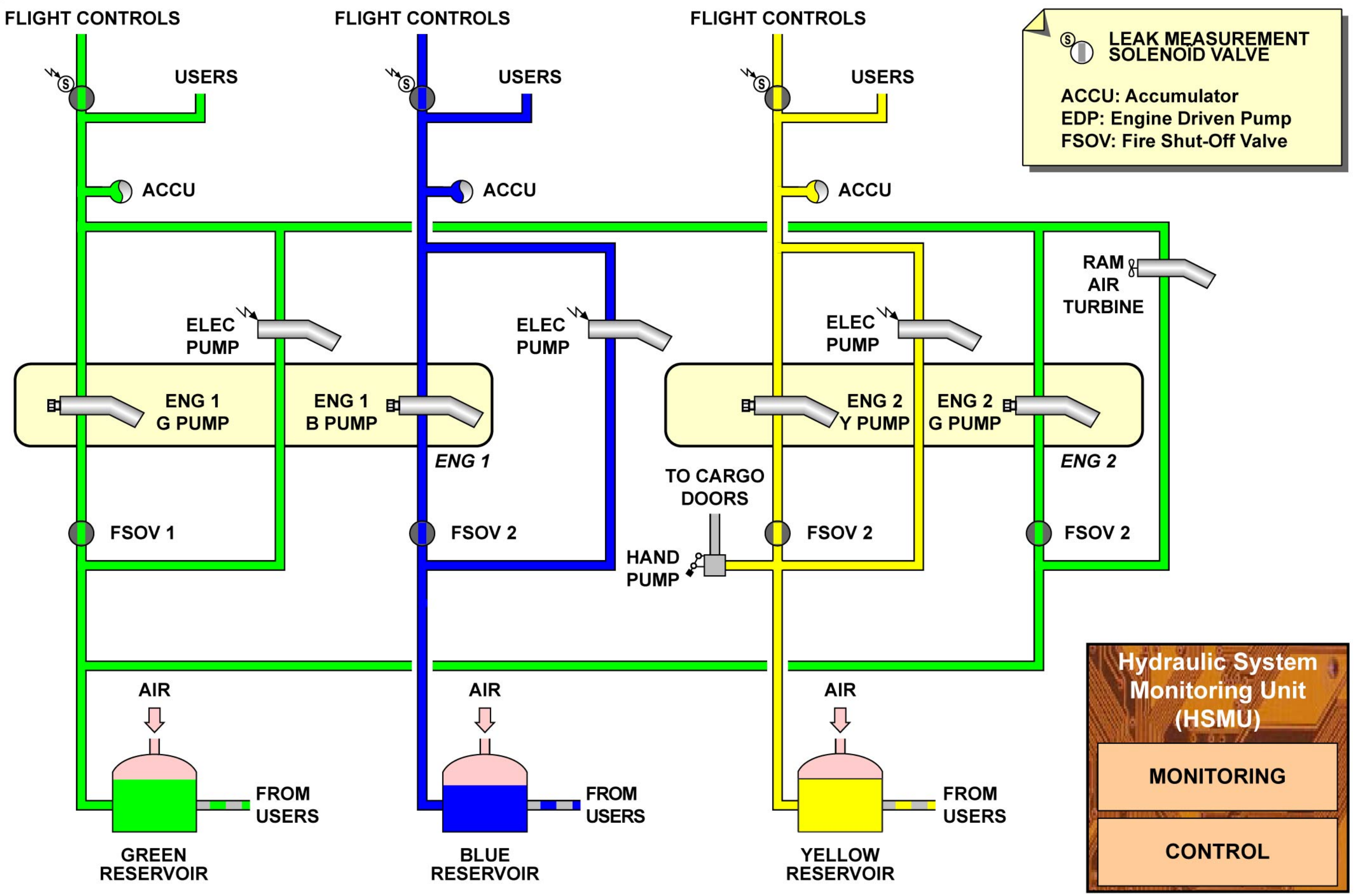
GENERAL

The hydraulic power chapter is divided into:
- the hydraulic system,
- the maintenance/test facilities.

When you work on A/C, you must obey all the safety procedures listed in the AMM.
There are three independent hydraulic systems: Green, Blue and Yellow. In normal operation, they are powered by Engine-Driven Pumps (EDPs) at a nominal pressure of 3.000 psi. The hydraulic supply to the EDPs can be shut off in case of emergency by means of the Fire Shut-Off Valves (FSOVs). Auxiliary power is supplied by electric pumps. A Ram Air Turbine (RAT) is included in the green system for emergencies. The Hydraulic System Monitoring Unit (HSMU) is used to monitor each hydraulic system, records failures, gives automatic control of the RAT extension, control of the electric pumps, and automatic closure of green FSOVs at low level.
Each system has its own air pressurized reservoir in order to prevent pump cavitation. The fluid supply to each EDP is done via a motorized FSOV. These valves can be closed manually or automatically (FSOVs green 1 & 2) following some failures.
Each engine accessory gearbox drives two variable displacement hydraulic pumps. The pump maintains a system nominal pressure of 3000 psi. Each EDP is lubricated by the hydraulic fluid. Each system has an auxiliary electric pump. All the electric pumps can be manually started for maintenance operation on ground or anytime in flight. On the yellow system, the electric pump operates automatically during cargo door operation.
Each system has an accumulator to maintain a constant pressure during normal operation to cover transient demands. For each system, a leak measurement solenoid valve is located downstream of the pumps.
They are controlled in the cockpit and isolate the flight control surfaces (on ground only).
The RAT is installed on the green system and can be manually or automatically extended following failures in flight. The RAT compartment is closed by a RAT operated door. A hand pump is installed on the yellow system and is only used for cargo door operation. Another pump is installed on the green ground service panel for reservoir filling.



SYSTEM INTRODUCTION - GENERAL



SYSTEM INTRODUCTION - GENERAL

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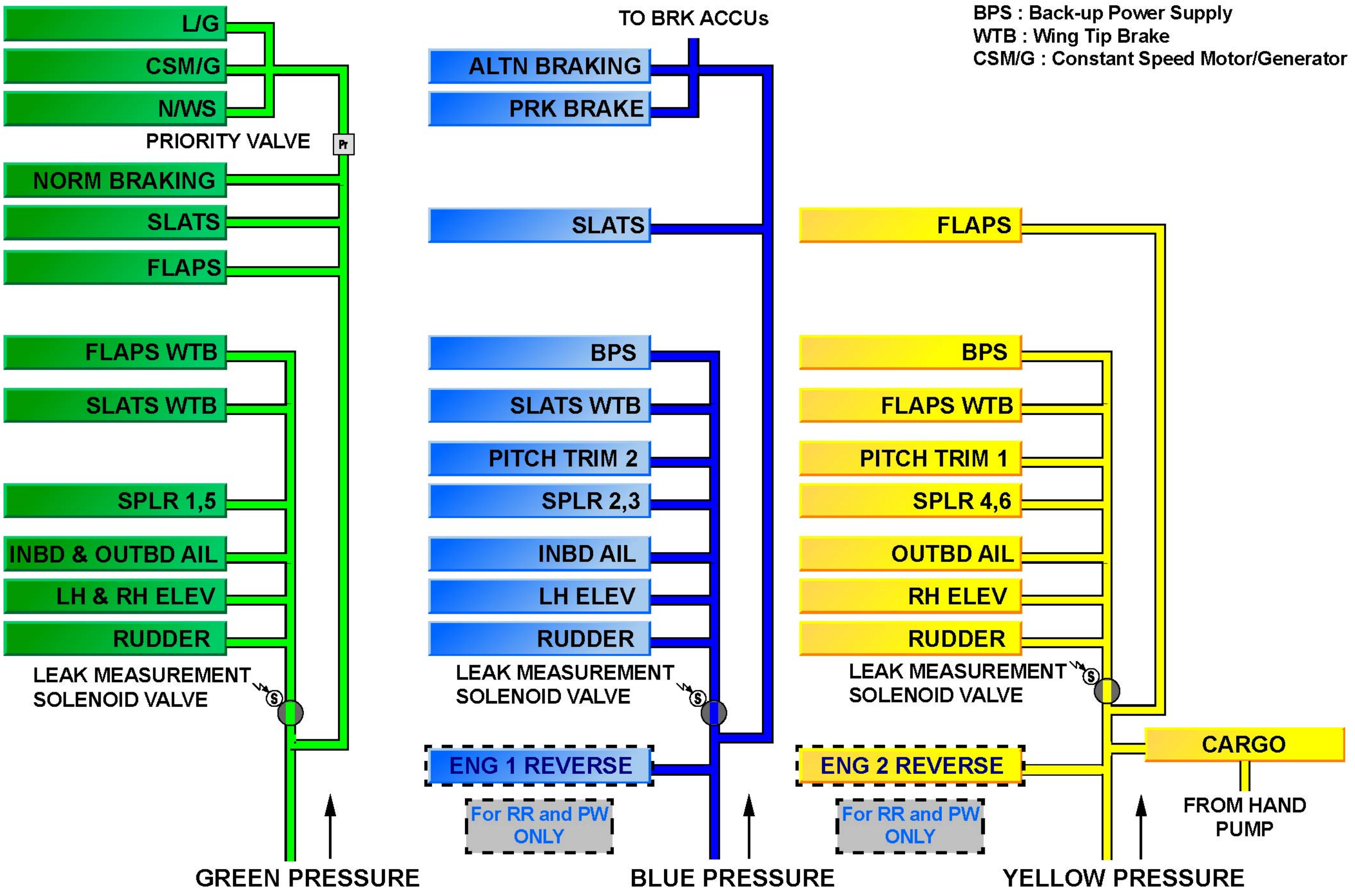
29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

SYSTEM INTRODUCTION (continued)

USERS

The blue system supplies the thrust reverser 1 and the yellow system supplies the thrust reverser 2 (For RR and PW engines). The flight controls supply, which is evenly divided between the three hydraulic systems, is done through the leak measurement valves. These valves can be closed for maintenance operation. The hydraulic supplied to the heavy users is taken before the leak measurement valves, and the green system includes a priority valve which cuts the supply to the L/G, nose wheel steering and emergency generator in case of green low pressure.



SYSTEM INTRODUCTION - USERS

29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

CONTROLS

All the controls for the flight controls are located in the cockpit.

HYDRAULIC CONTROL PANEL

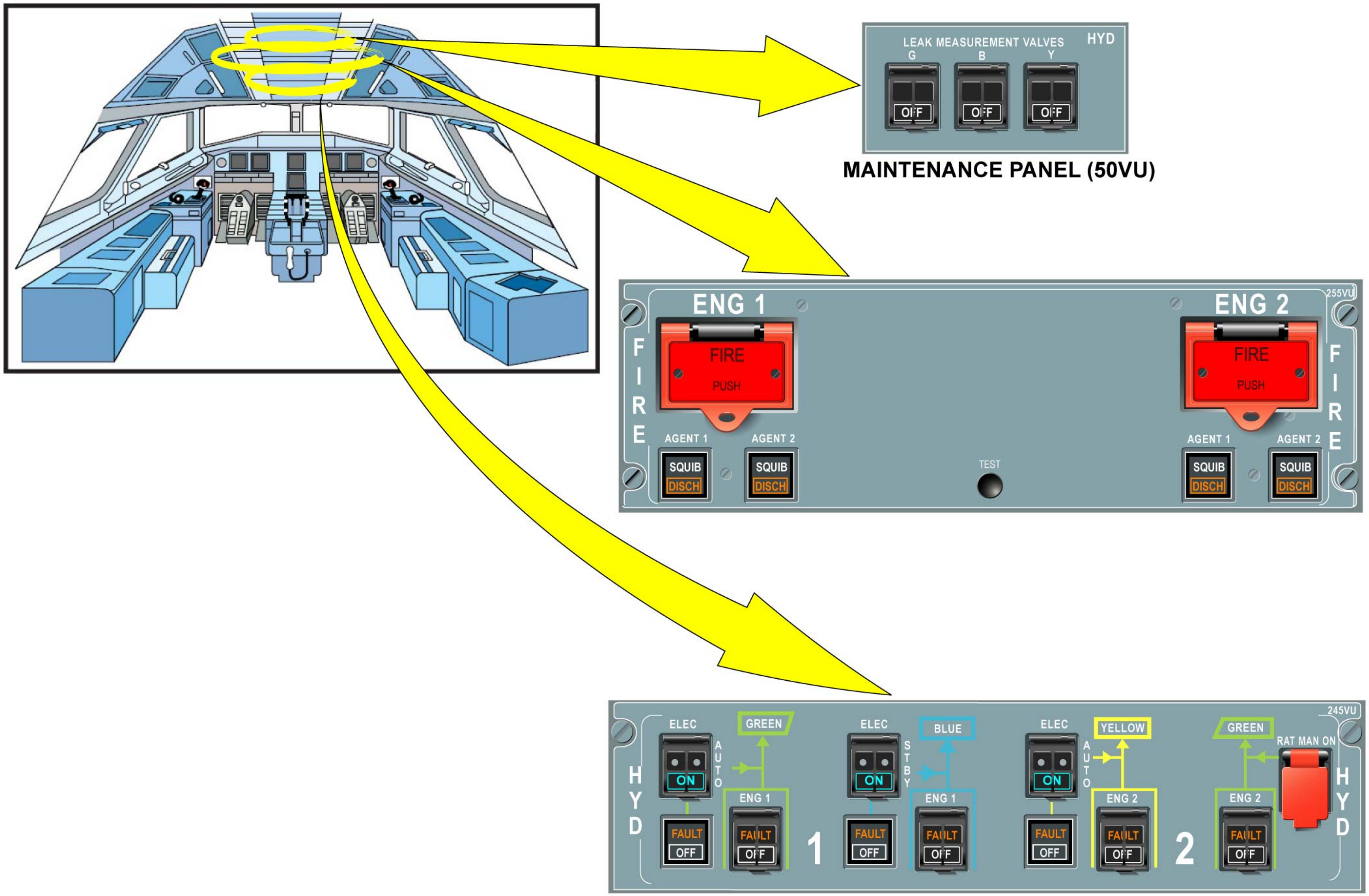
The EDPs, electrical pumps and the RAT are operated from the HYDraulic control panel and monitored on the HYD ECAM page.

ENGINE FIRE PANEL

On the engine FIRE panel, the ENGine 1 (2) P/Bs released out will close the related FSOVs.

MAINTENANCE PANEL

The hydraulic leak measurement system is used for maintenance function only.

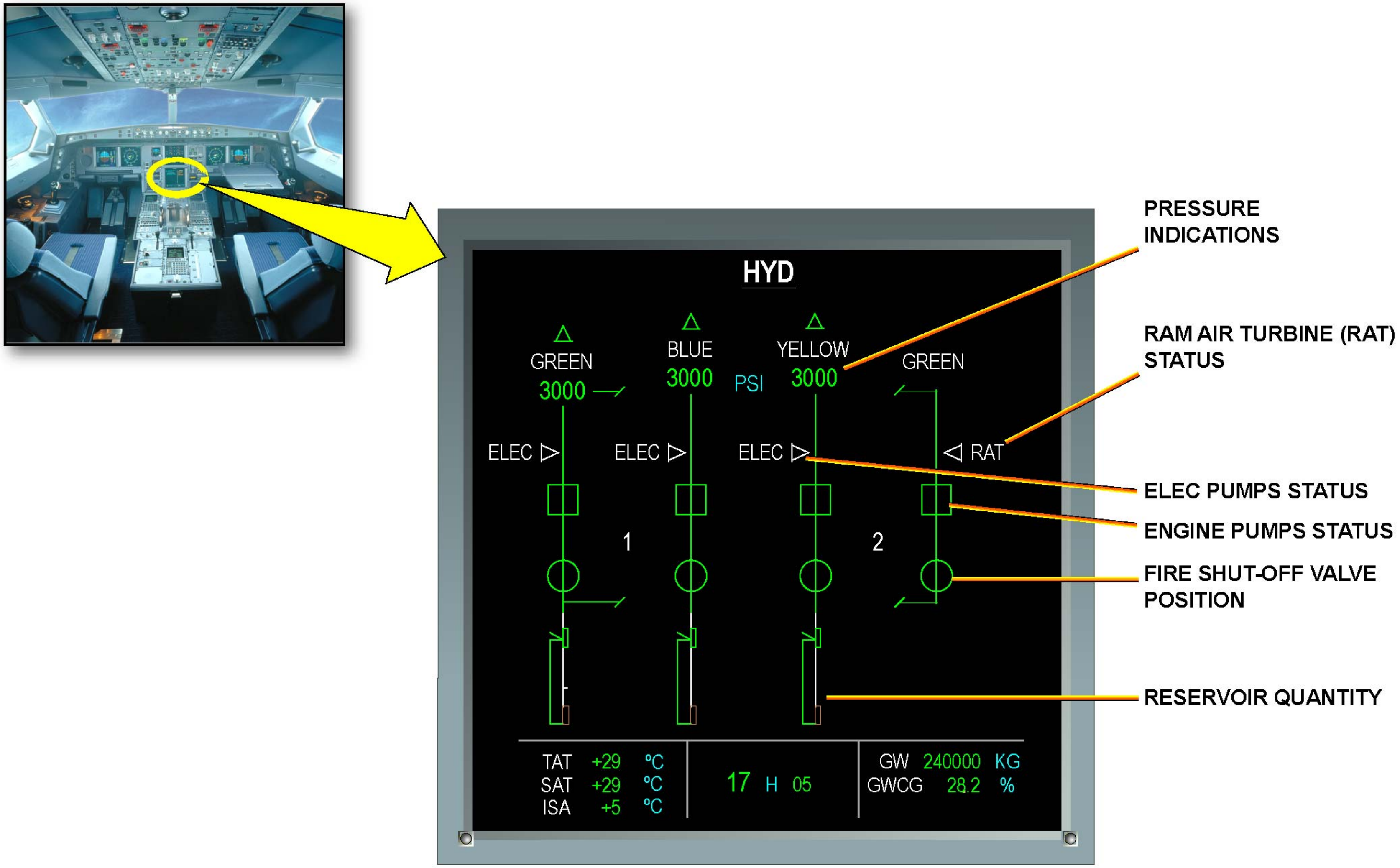


CONTROLS - HYDRAULIC CONTROL PANEL ... MAINTENANCE PANEL

29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

INDICATING

The items displayed on the ECAM HYD page are:
- reservoirs quantity,
- FSOVs position,
- pumps status,
- RAT status,
- pressure indications.


HYD
GREEN
3000
BLUE
3000
PSI
YELLOW
3000
GREEN
ELEC
ELEC
ELEC
RAT
1
2
TAT +29 °C
SAT +29 °C
ISA +5 °C
17 H 05
GW 240000 KG
GWCG 28.2 %
PRESSURE INDICATIONS
RAM AIR TURBINE (RAT) STATUS
ELEC PUMPS STATUS
ENGINE PUMPS STATUS
FIRE SHUT-OFF VALVE POSITION
RESERVOIR QUANTITY

INDICATING

29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

COMPONENT LOCATION

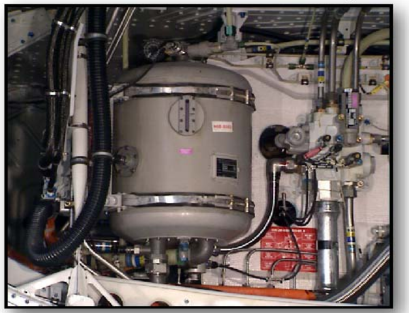
RESERVOIRS

The green reservoir is located inside the MLG bay, on the left section of the aft wall. The yellow reservoir is located inside the yellow hydraulic compartment, on the right forward section of the belly fairing. The blue reservoir is located inside the blue hydraulic compartment, on the left forward section of the belly fairing.

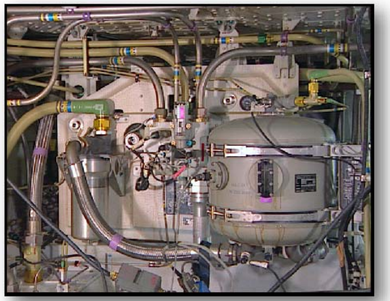
ENGINE PUMPS

The green EDPs are attached to the accessory gearbox at the bottom of the engines 1 and 2. The blue EDP is attached to the accessory gearbox at the bottom of the engines 1. The yellow EDP is attached to the accessory gearbox at the bottom of the engine 2.

ENGINE DRIVEN PUMP (EDP)

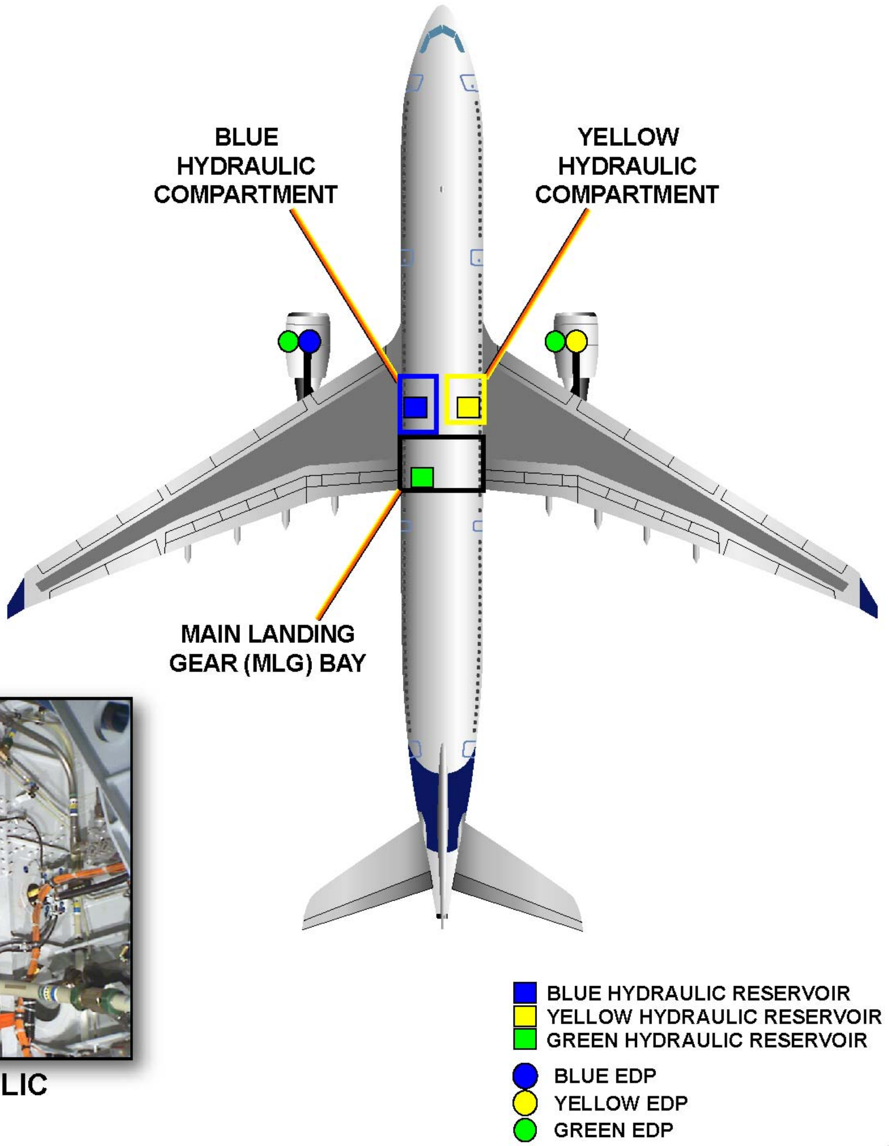


BLUE HYDRAULIC RESERVOIR



YELLOW HYDRAULIC RESERVOIR

GREEN HYDRAULIC RESERVOIR



COMPONENT LOCATION - RESERVOIRS & ENGINE PUMPS

29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

COMPONENT LOCATION (continued)

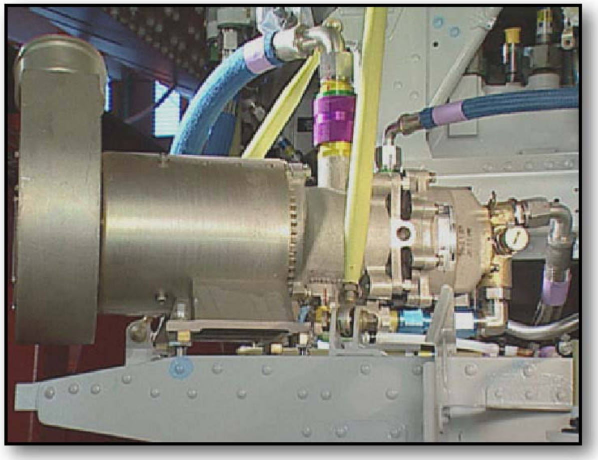
ELECTRICAL PUMPS

The green electrical pump is located inside the MLG bay, on the left section of the aft wall. The yellow electrical pump is located inside the yellow hydraulic compartment, on the right forward section of the belly fairing. The blue electrical pump is located inside the blue hydraulic compartment, on the left forward section of the belly fairing.

RAM AIR TURBINE

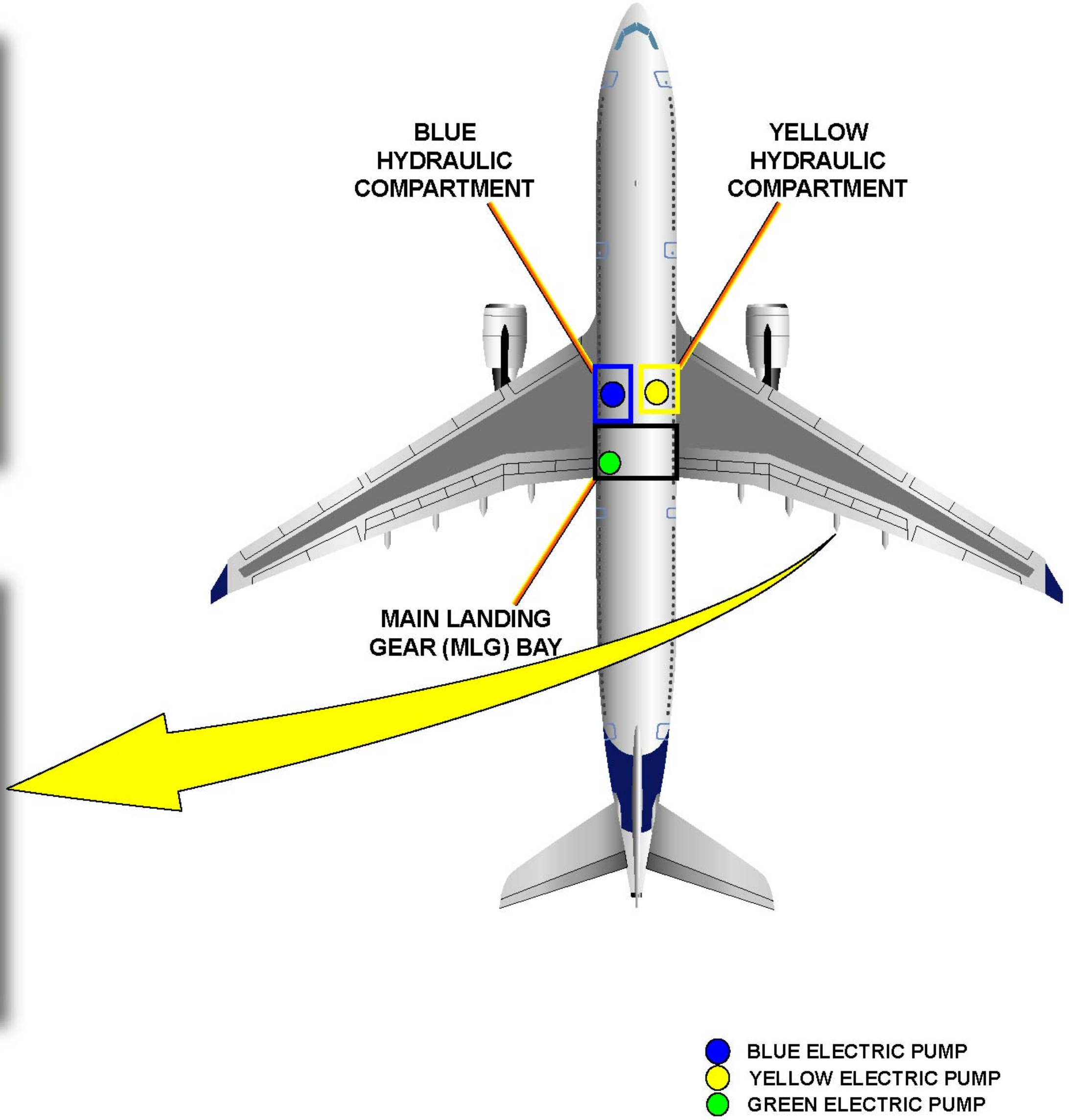
The RAT and related components (Green system) are located on the right wing in the fairing of the flap track number 4 (fairing number 3).

G6B08031 - G10T4T0 - FM29P5000000003



ELECTRIC PUMP

RAM AIR TURBINE (RAT)



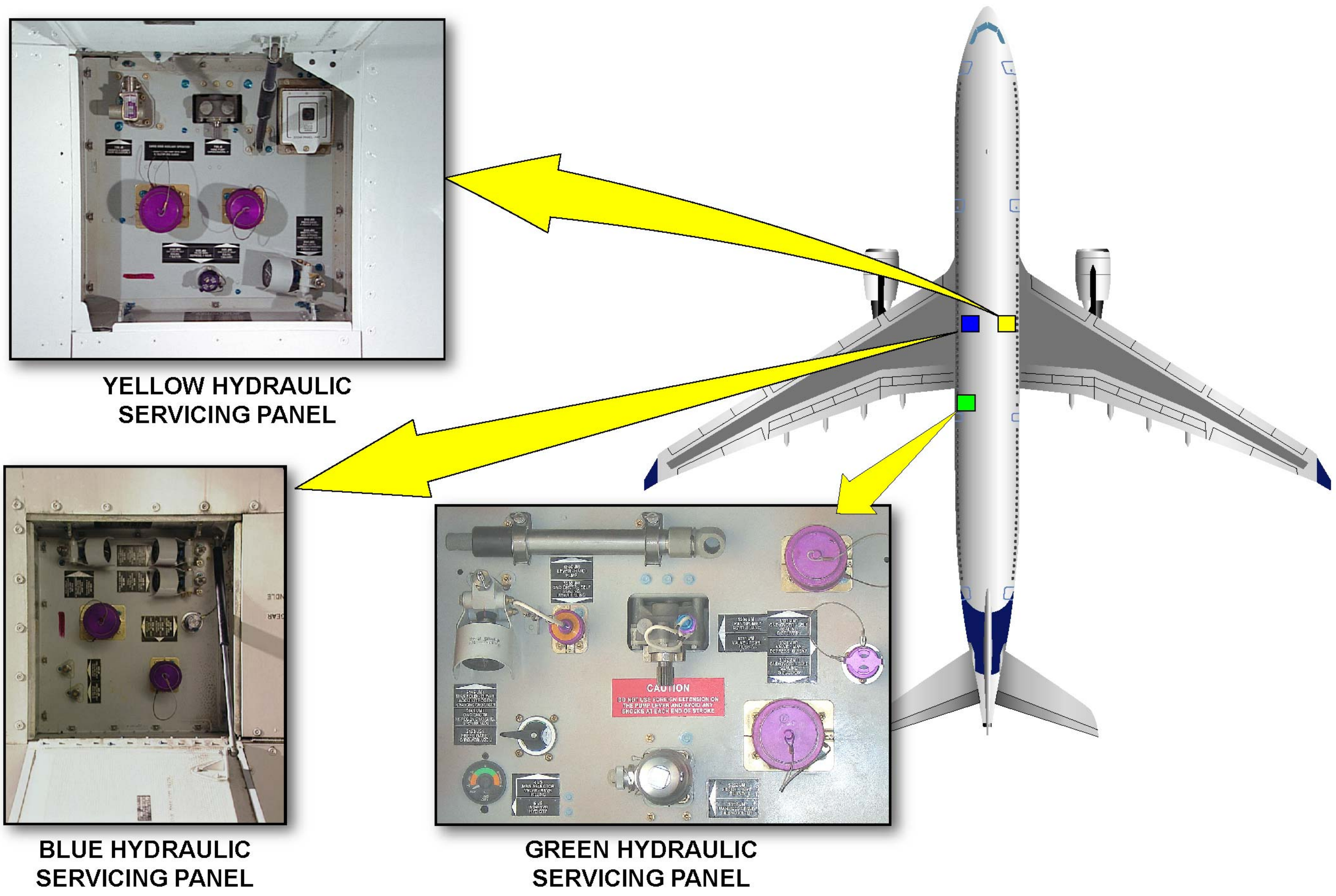
COMPONENT LOCATION - ELECTRICAL PUMPS & RAM AIR TURBINE

29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

COMPONENT LOCATION (continued)

SERVICING PANELS

The hydraulic servicing panels are located on the belly fairing on the left aft section for the green system, left forward section for the blue system and on the right forward section for the yellow system.



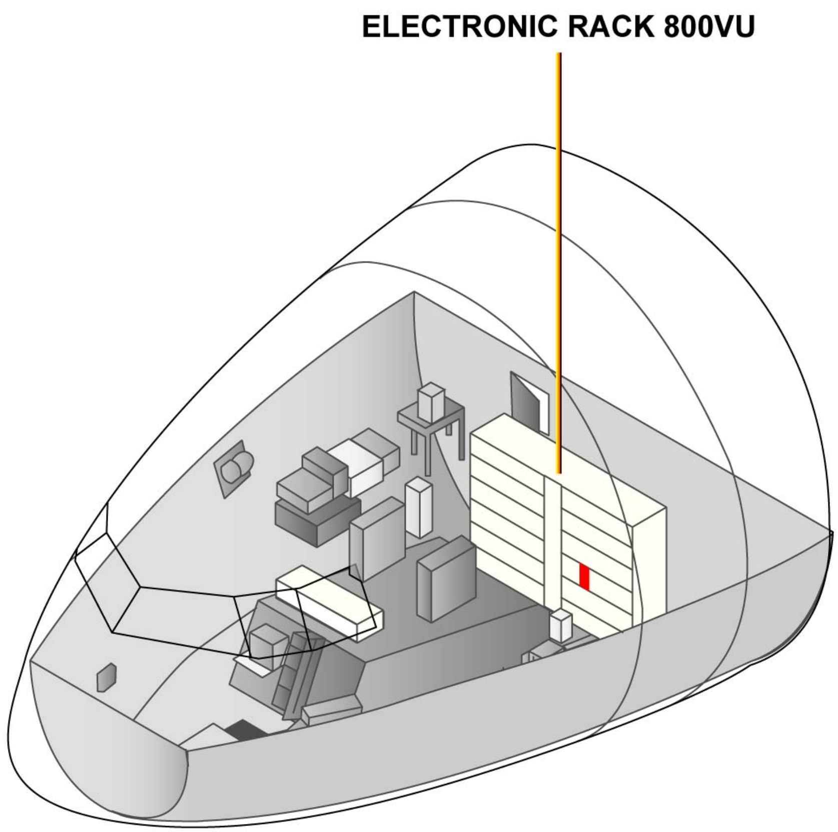
COMPONENT LOCATION - SERVICING PANELS

29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

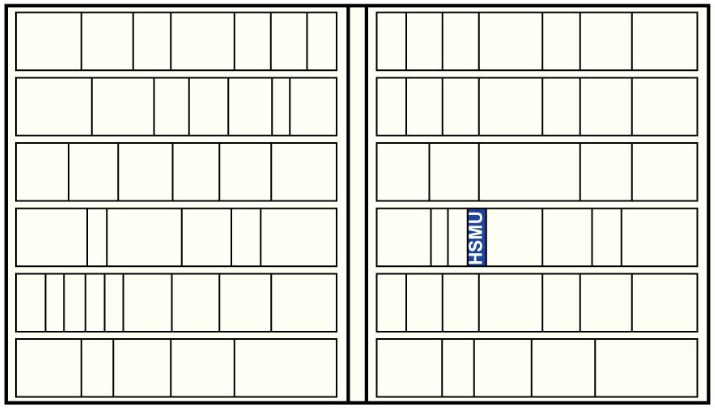
COMPONENT LOCATION (continued)

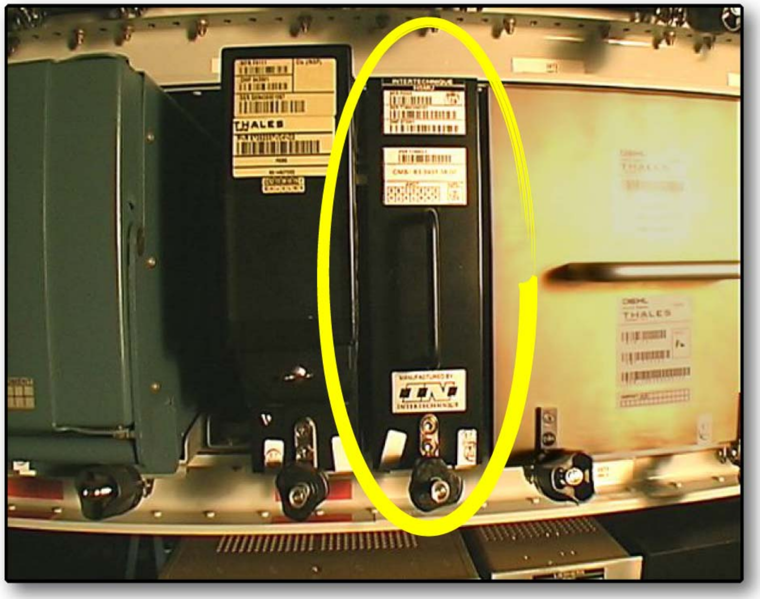
HSMU

The HSMU is located inside of the electronic compartment in the electronic rack 800VU.



ELECTRONICS RACK (800VU)





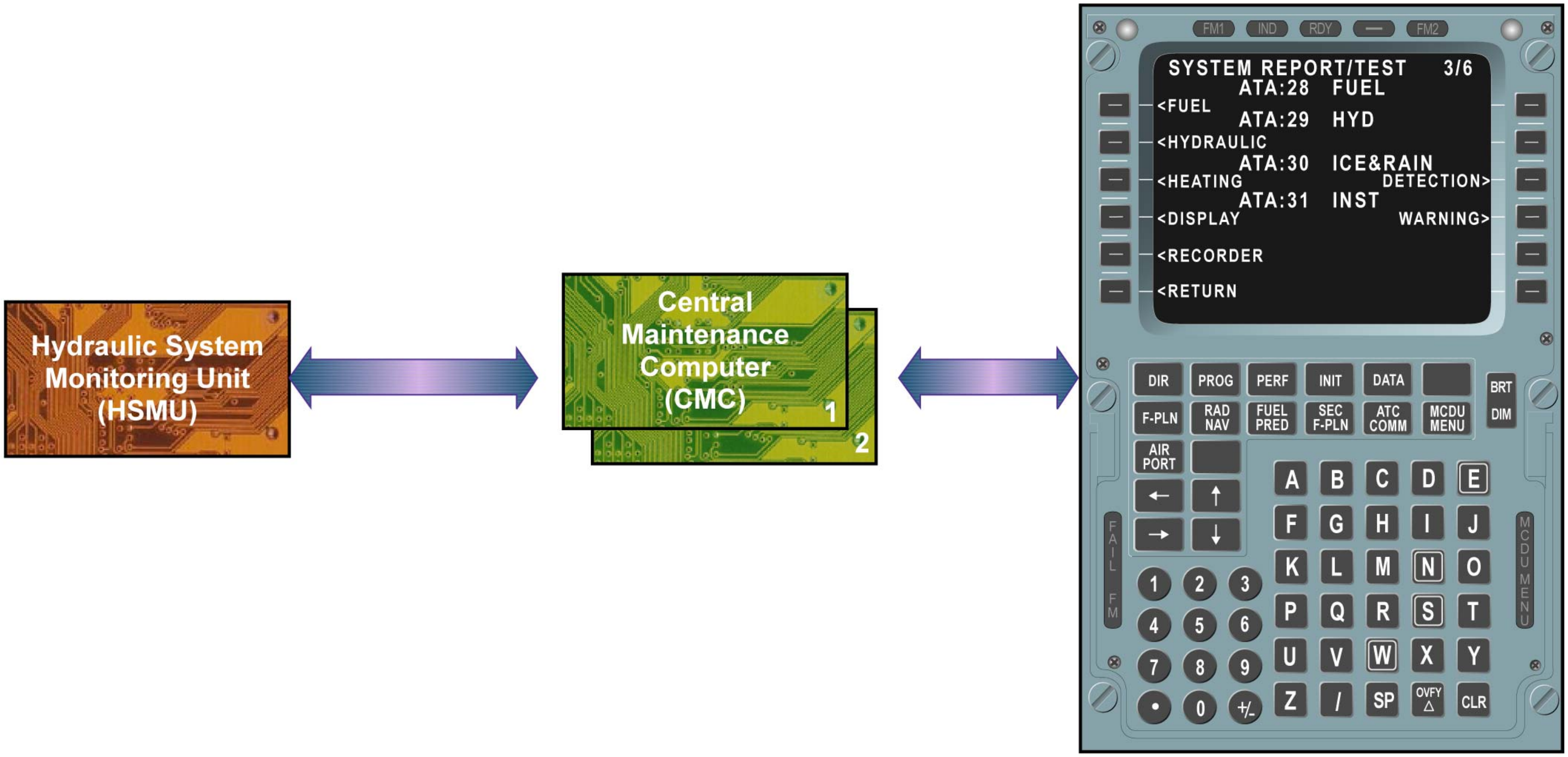
HYDRAULIC SYSTEM MONITORING UNIT (HSMU)

COMPONENT LOCATION - HSMU

29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

The HSMU has a BITE that tests, manages and records failures to help the maintenance operations. HSMU BITE information is sent to the MCDUs though the Central Maintenance Computers.

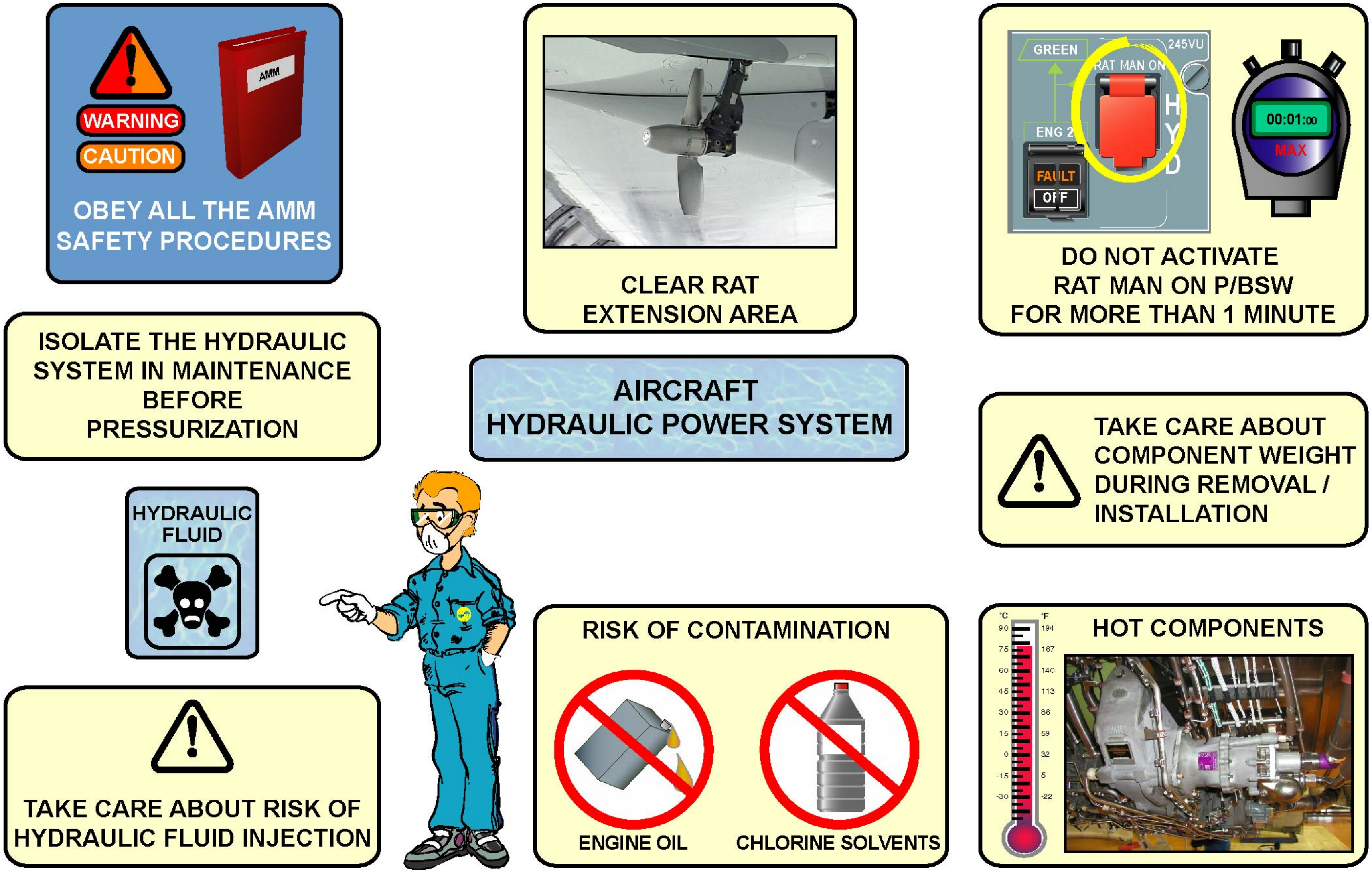


MAINTENANCE/TEST FACILITIES

29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

When you work on aircraft, make sure that you obey all the Aircraft Maintenance Manual safety procedures. This will prevent injury to persons and/or damage to the aircraft. Here is an overview of the main safety precautions relative to the hydraulic power system. Make sure that the hydraulic system in maintenance is isolated before you pressurize the other hydraulic systems. Do not get hydraulic fluid or hot gas from the hydraulic reservoir on your body. Use protective clothing to prevent risk of poisoning and burns. Use solvents, jointing compound and other special materials in a ventilated area. To prevent inadvertent breathing or contact with your body, use applicable gloves, eye protections and face mask. During the hydraulic leak check, do not touch the hydraulic components under high pressure and do not stay near these components. Put on protective clothing to prevent inadvertent fluid injection. Do not use engine oil / chlorine solvents on the hydraulic systems. This will prevent contamination of the hydraulic fluid and damage to the components. Do not touch the hydraulic system components until they are cool. The engine components stay hot and can burn you. Be careful during removal/installation of heavy components to prevent injury to persons and damage to equipment. Do not push the RAT MANual ON P/B for more than 1 minute this will prevent damage. During the RAT test, which can lead to RAT extension, keep all persons away from the RAT area and make sure that the RAT travel range is clear. Movement of the RAT can cause injury and/or damage.



SAFETY PRECAUTIONS

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29 HYDRAULIC POWER SYSTEM PRESENTATION (1)

ENVIRONMENTAL PRECAUTIONS

Do not discharge products such as oil, fuel, solvent, lubricant either in trash bins, soil or into the water network (drains, gutters, rain water, waste water, etc...).
Sort waste fluids and use specific waste disposal containers.
Each product must be stored in an appropriate and specific cabinet or room such as a fire-resistant and sealed cupboard.

STORE PRODUCTS IN APPROPRIATE CONTAINER/CUPBOARD/ROOM

SORT WASTE FLUIDS IN CONTAINERS

AVOID FLUID SPILLAGE
USE APPROPRIATE STORAGE EQUIPMENT FOR CHEMICAL PRODUCTS

FLUID SPILL CLEANUP KIT

USE SPECIFIC WASTE DISPOSAL CONTAINERS

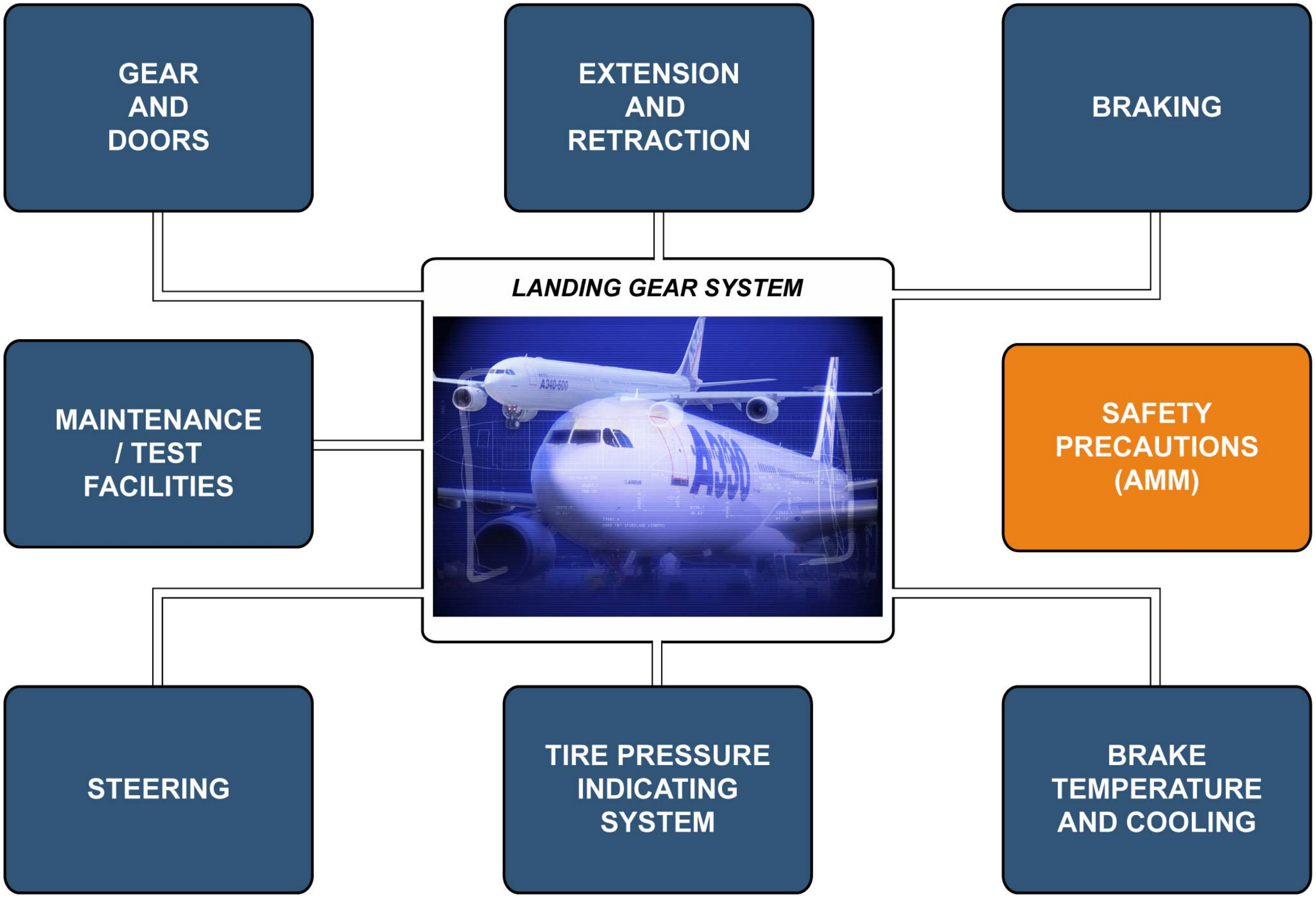
ENVIRONMENTAL PRECAUTIONS

32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR

The L/G system supports the A/C on the ground and transmits landing, takeoff and taxi loads to the structure. It also decreases the A/C speed through the braking system and steers the A/C on ground. The L/G system is divided into:
- the gear and doors,
- the extension and retraction,
- the braking,
- the brake temperature and cooling,
- the Tire Pressure Indicating System (TPIS),
- the steering,
- the maintenance/test facilities.

When you work on A/C, you must obey all the safety procedures listed in the AMM.
The L/G and doors are supplied by the green hydraulic system. The Nose Landing Gear (NLG) system is composed of the nose gear and doors. Some doors are electrically controlled and hydraulically operated, the others are mechanically linked to the gear structure. The Main Landing Gear (MLG) system is composed of the main gear and doors. Some doors are electrically controlled and hydraulically operated, the others are mechanically linked to the gear structure. When you work on aircraft, you must obey all the safety procedures listed in the Aircraft Maintenance Manual (AMM).



LANDING GEAR

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LANDING GEAR

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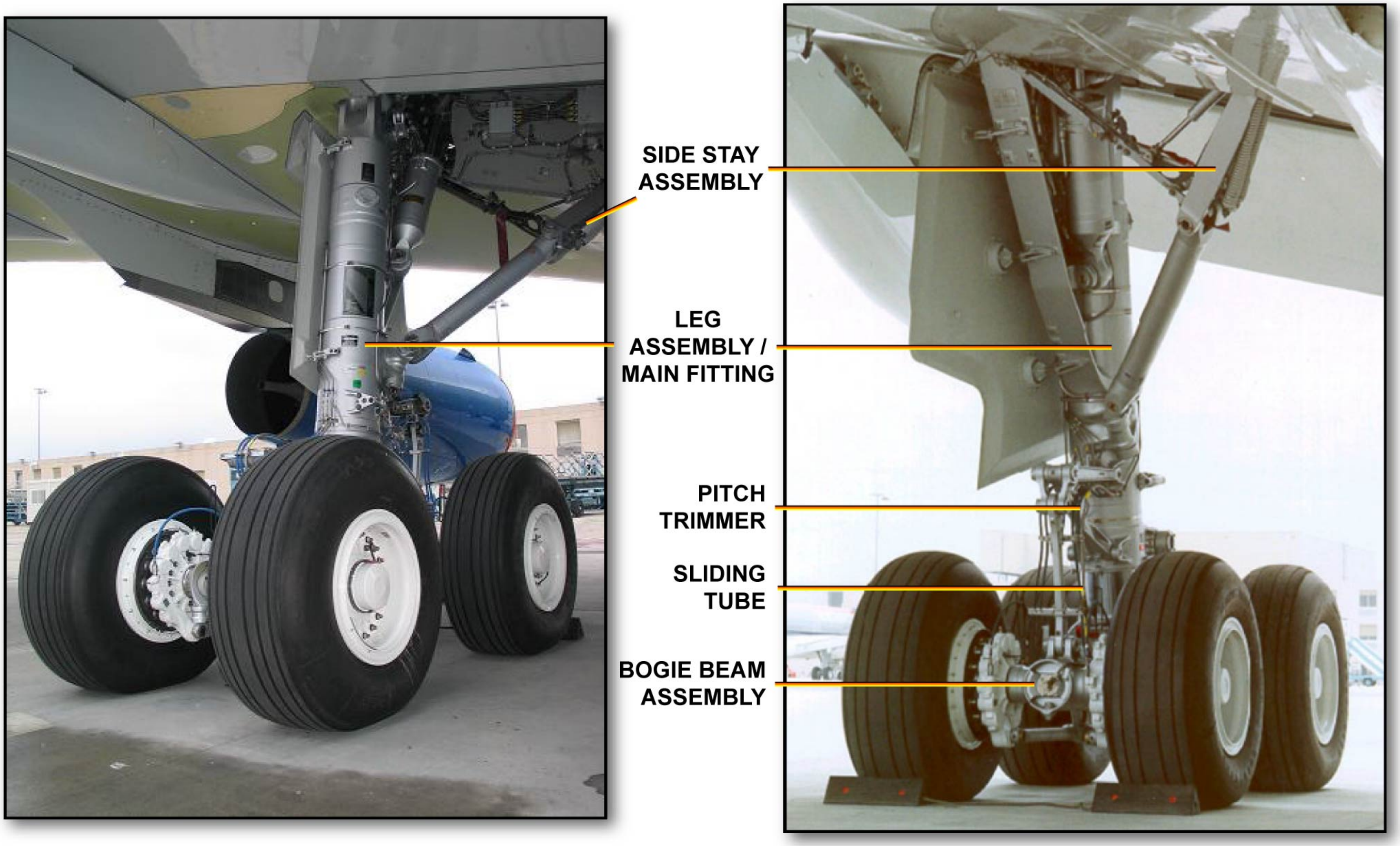
32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR (continued)

MAIN LANDING GEAR (MLG)

Each MLG, which retracts inboard into its wheel bay in the fuselage and the wing, includes these main parts:
- a side stay assembly,
- a MLG leg assembly,
- a bogie alignment pitch trimmer,
- a bogie beam assembly.

The MLG is hydraulically operated during the normal extension/retraction sequence.
The MLG leg includes a shortening mechanism, a bogie pitch trimmer and an oleo-pneumatic shock absorber. The shock absorber absorbs the taxi, TO and landing loads. The shock absorber is a capsule type that includes a sliding tube. It is an oleo-pneumatic unit that is installed in the main fitting.



LANDING GEAR - MAIN LANDING GEAR (MLG)

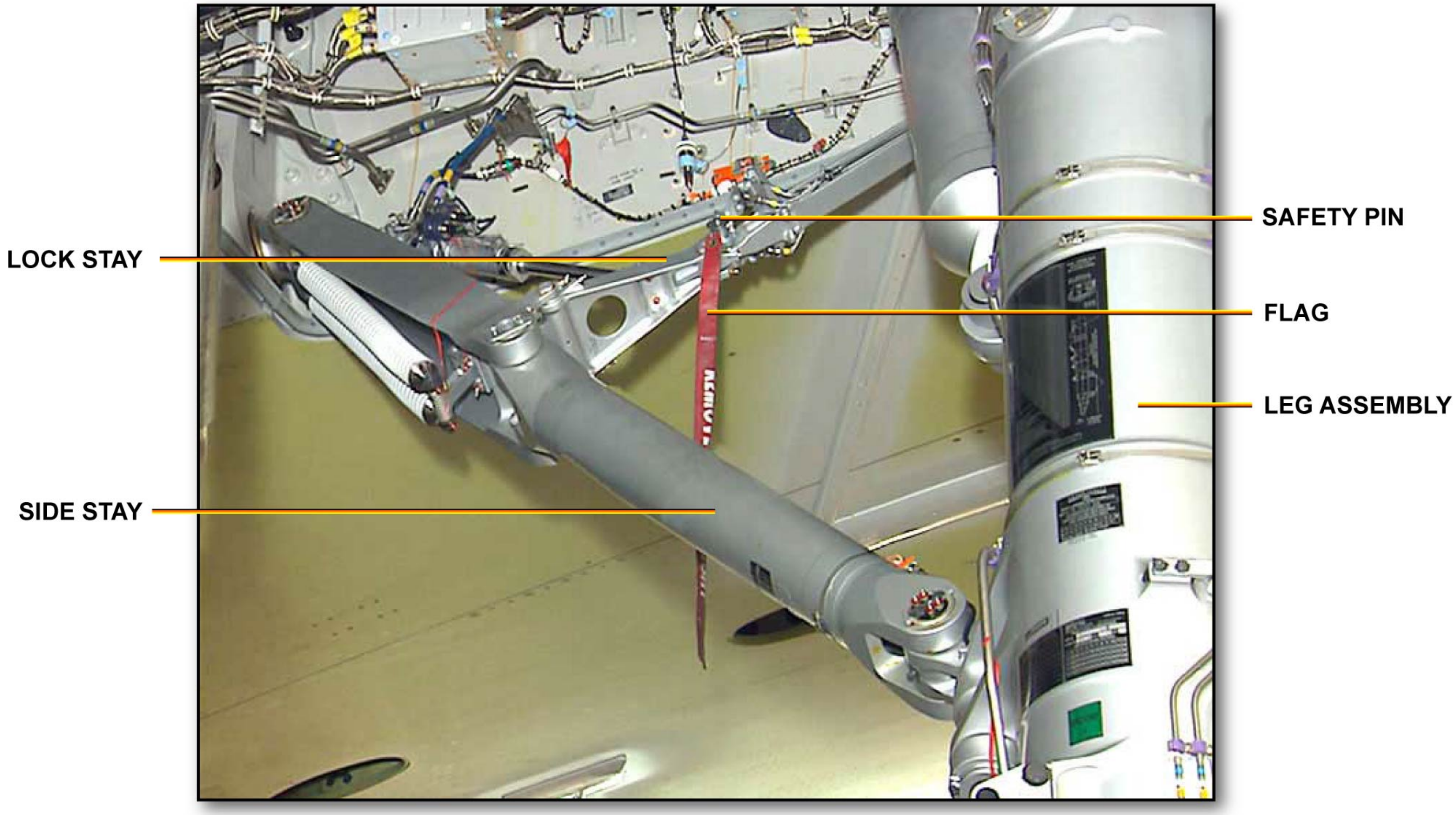
G6B08031 - G10T4T0 - FM32P8000000003

32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR (continued)

MLG SIDE STAY ASSEMBLY

A two-piece side stay assembly holds the MLG in the extended position. The lock stay is the mechanical down lock for the MLG. A lock stay keeps the side stay assembly stable in the locked down position. The lock stay is the mechanical down lock for the MLG. A ground lock pin has to be installed through the links of the lock stay, when they are in the over center position, to comply with safety precautions.



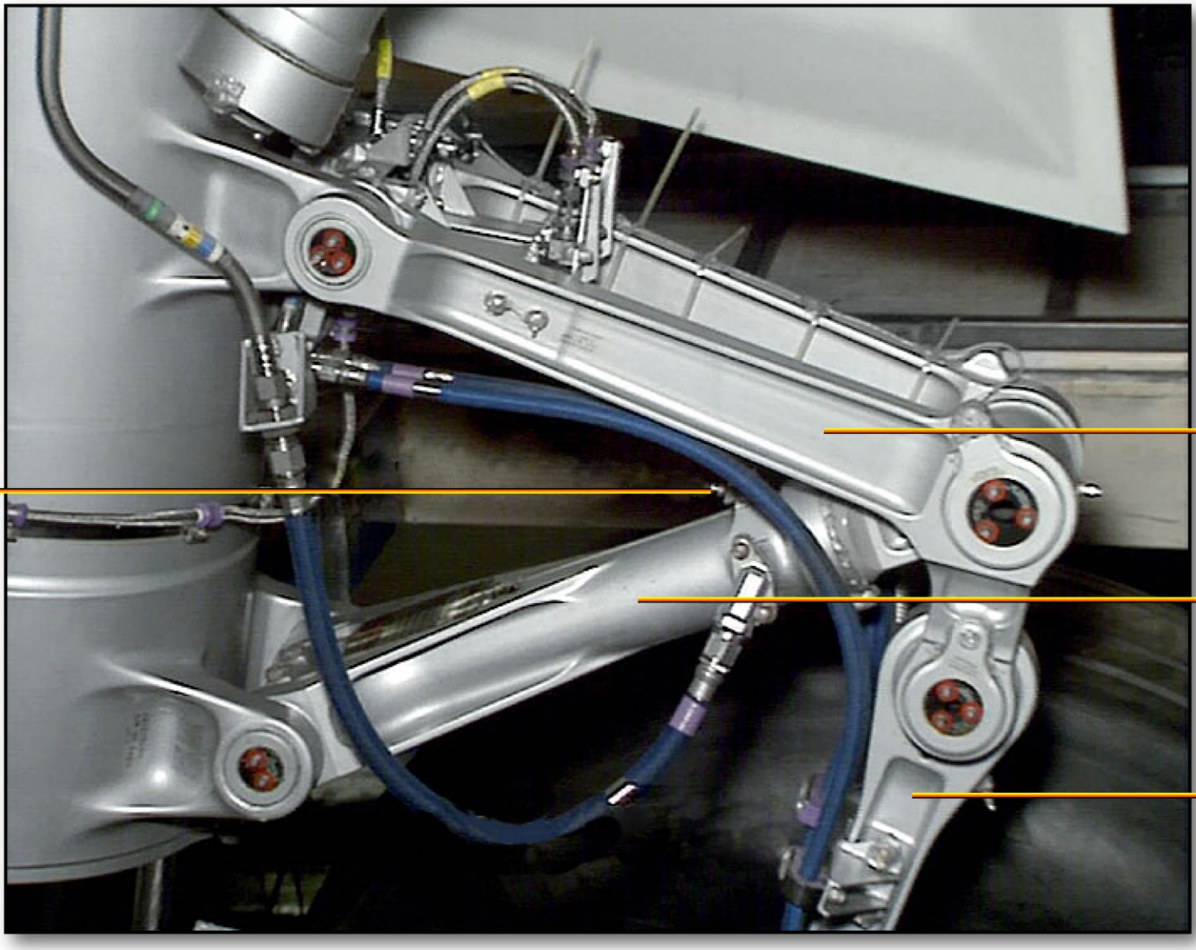
LANDING GEAR - MLG SIDE STAY ASSEMBLY

32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR (continued)

MLG BOGIE ALIGNMENT PITCH TRIMMER

The pitch trimmer is installed between the main fitting and the upper links. A set of articulated links, two upper and one lower, connects the main fitting to the front of the bogie beam. The green hydraulic system continuously supplies pressure to the pitch trimmer, which maintains the required geometry of the links during the retraction sequence, TO, and landing phases.



LANDING GEAR - MLG BOGIE ALIGNMENT PITCH TRIMMER

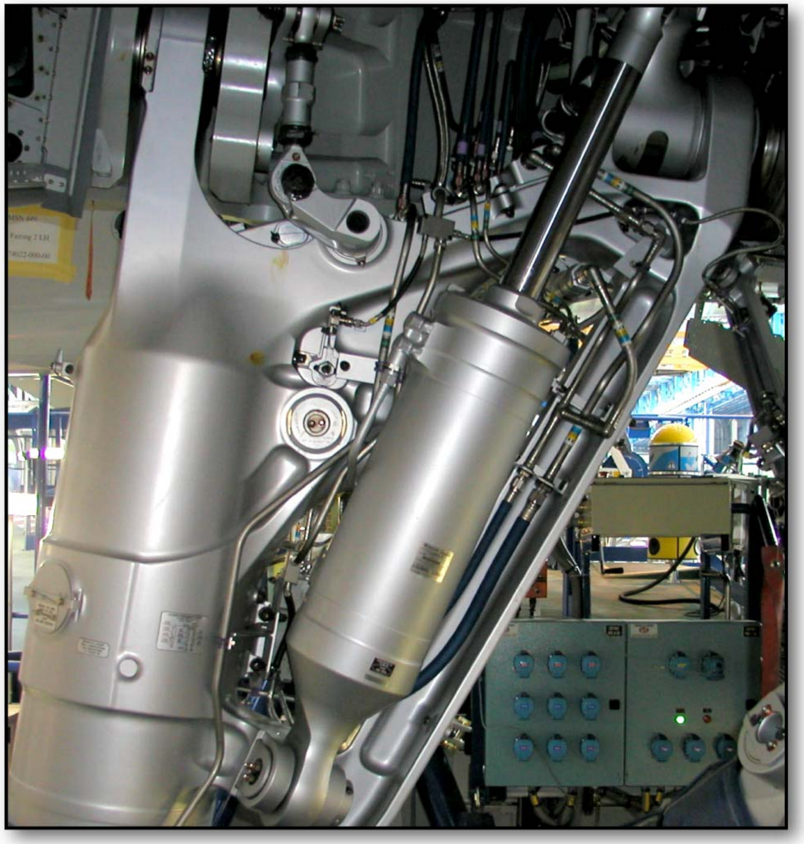
G6B08031 - G10T4T0 - FM32P8000000003

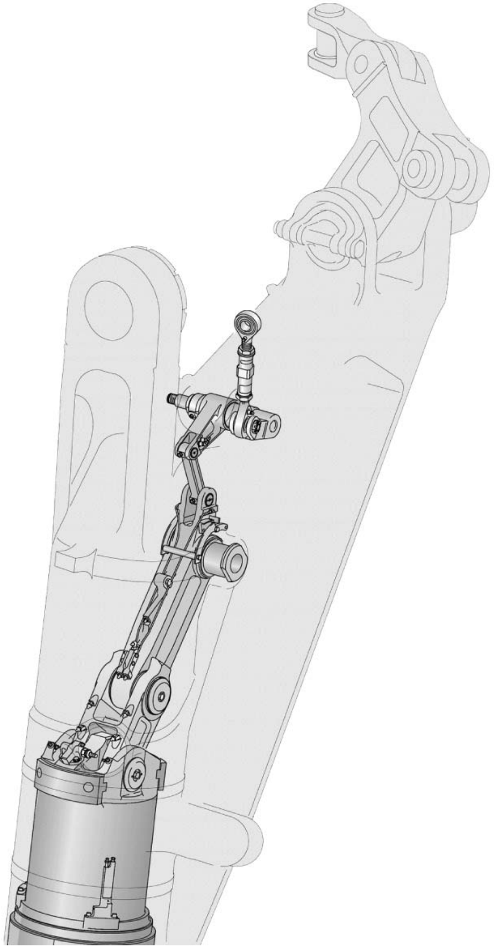
32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR (continued)

MLG SHORTENING MECHANISM

During the retraction the shortening mechanism decreases the overall length of the MLG to permit the gears to go into the available space in the bays. The shortening mechanism includes a turnbuckle link connected on one end to the airframe wing and a system of mechanical links that is attached to the shock absorber. The MLG movement operates the shortening mechanism during retraction or extension.





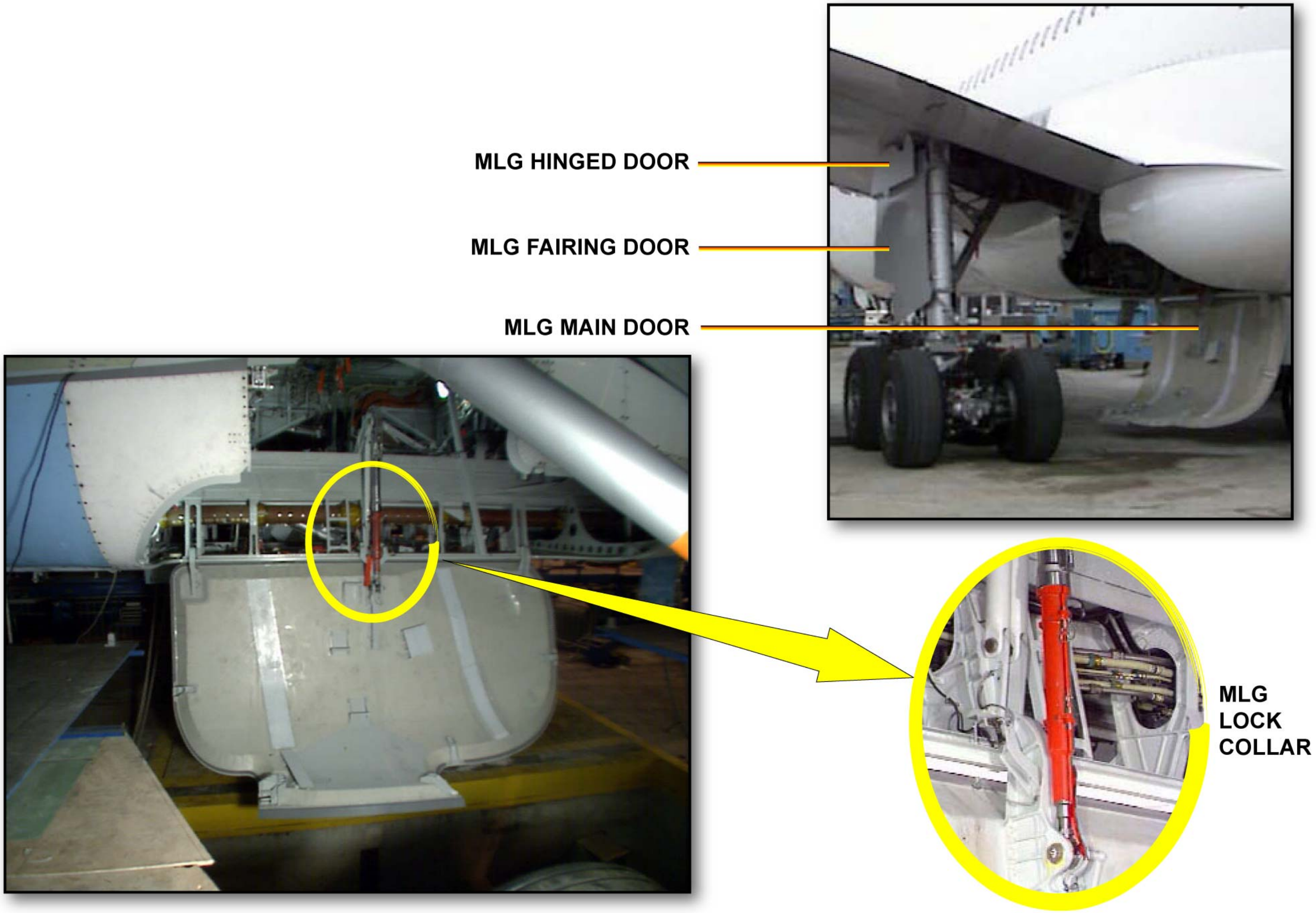
LANDING GEAR - MLG SHORTENING MECHANISM

32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR (continued)

MLG DOORS

Three doors close each MLG bay. They follow the shape of the belly fairing and protect the equipment in the bay from the airflow during flight. The MLG doors are hydraulically operated. Each main door is hinged at the keel beam and closes outboard. The fairing door is attached to the MLG leg and operates with it. The hinged door is connected to the MLG leg through an adjustable rod. When the main gear operates, the rod operates to move the hinged door. A lock collar can be installed on each door actuator when the aircraft is on the ground to prevent closure.



LANDING GEAR - MLG DOORS

32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR (continued)

NOSE LANDING GEAR (NLG)

Each NLG, which retracts forward into the NLG bay, includes these main parts:
- a lock stay assembly,
- a NLG leg assembly,
- steering actuators.

The NLG is hydraulically operated during the normal extension/retraction sequence.
The L/G leg has a main fitting with a sliding tube assembly that includes the axle and a shock absorber with a wheel steering assembly.
The nose wheels are steered by twin, double acting hydraulic actuators, which pivot on attachments on the main fitting.

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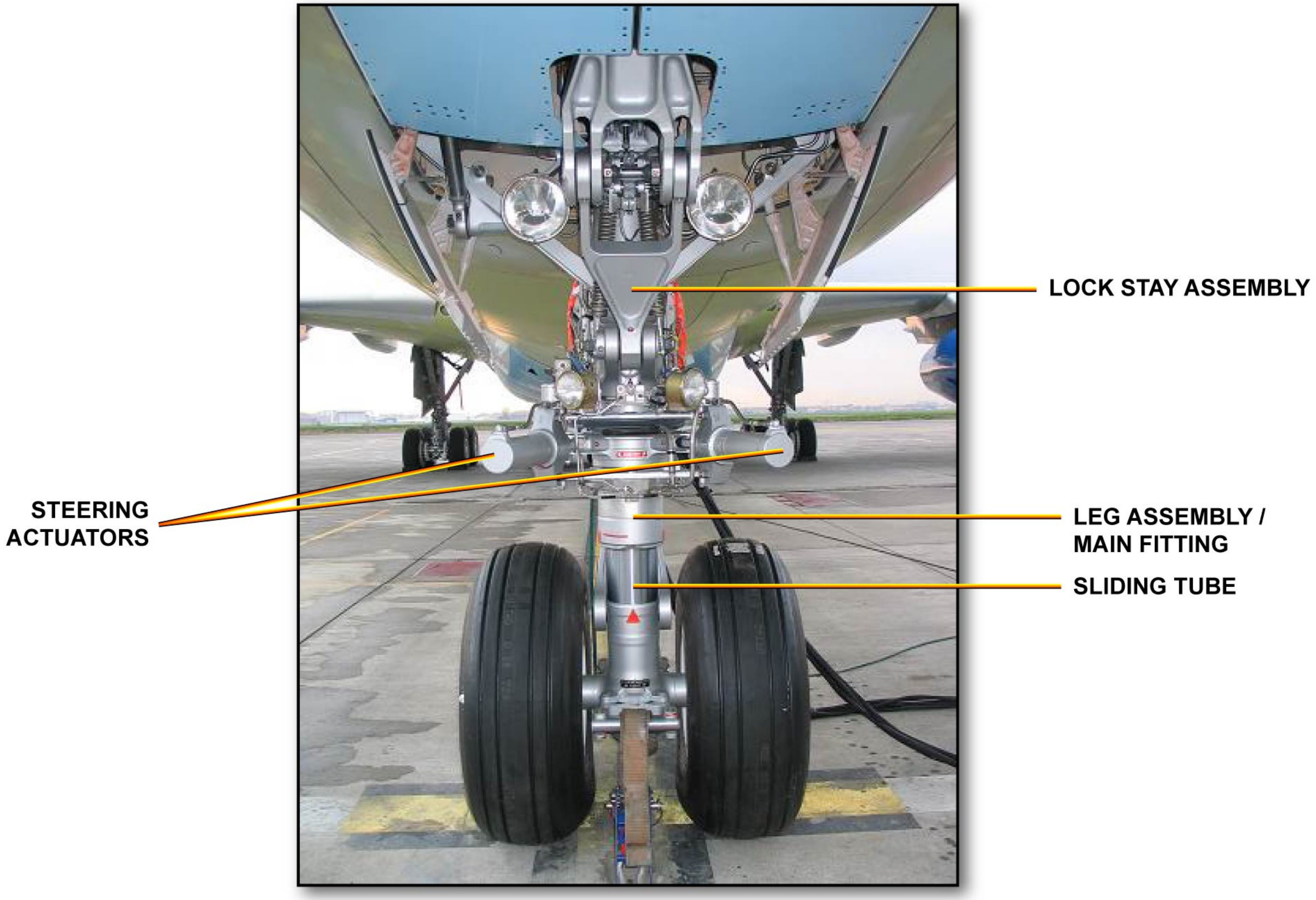


LANDING GEAR - NOSE LANDING GEAR (NLG)

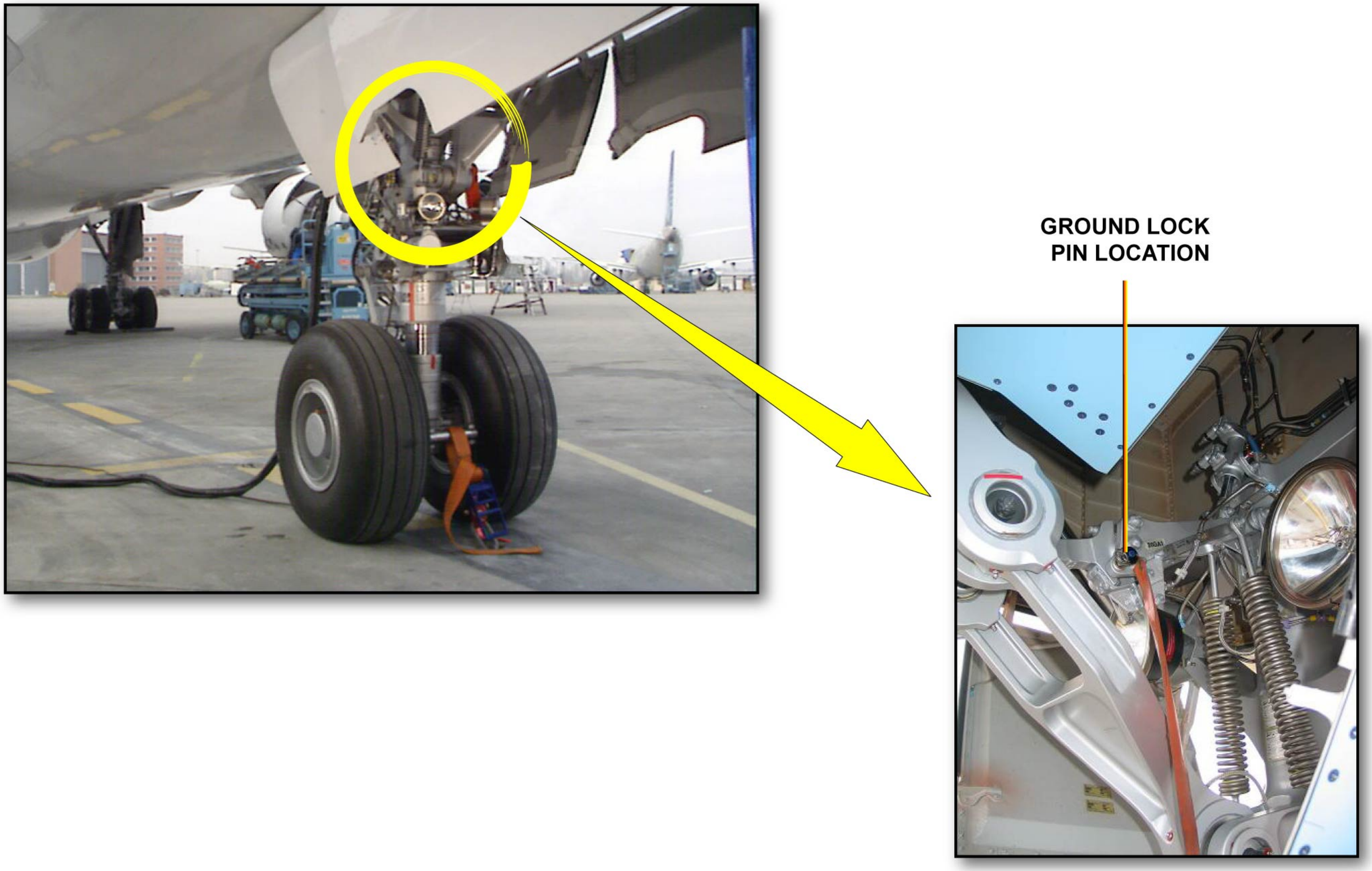
G6B08031 - G10T4T0 - FM32P8000000003

32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR (continued)

NLG LOCK STAY ASSEMBLY

The lock stay is installed between the main fitting and the center pivot point of the drag stay. It has an upper link and a lower link. The lock stay holds the drag stay in a straight configuration when the NLG is extended. A ground lock pin can be installed in the center pivot point of the lock stay when the NLG is down locked.



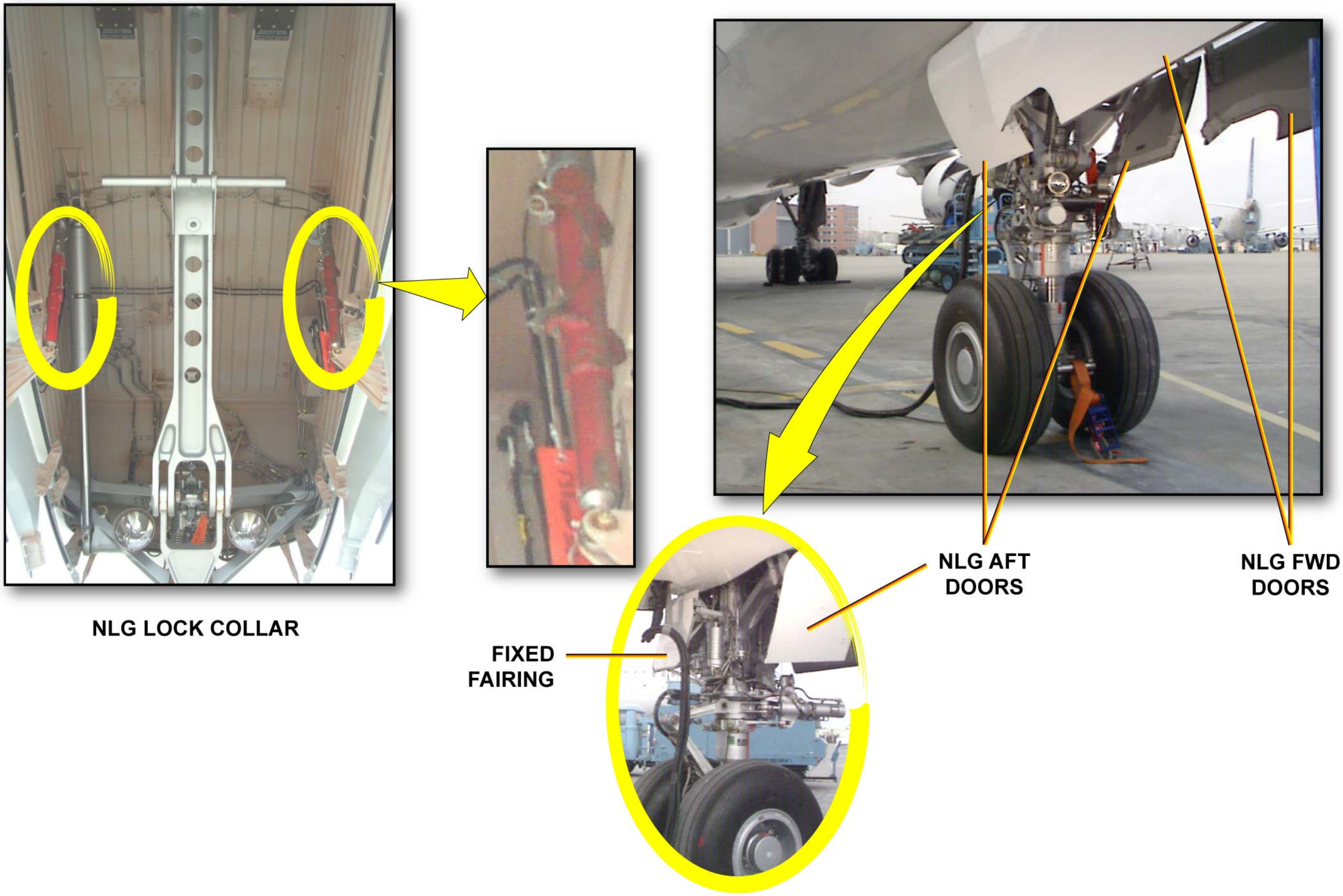
LANDING GEAR - NLG LOCK STAY ASSEMBLY

32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR (continued)

NLG DOORS

A lock collar can be installed on each door actuator when the aircraft is on the ground to prevent closure. Four doors and a fixed fairing close the NLG bay. The two forward doors are hydraulically operated. Each door has hinges at the side of the NLG bay and closes inward at the front of the bay. The two aft doors and the fixed fairing are mechanically operated. Each aft door has hinges at its outer edge. Adjustable rods connect the rear doors to the NLG leg. The fixed fairing is installed at the rear of the NLG leg.



LANDING GEAR - NLG DOORS

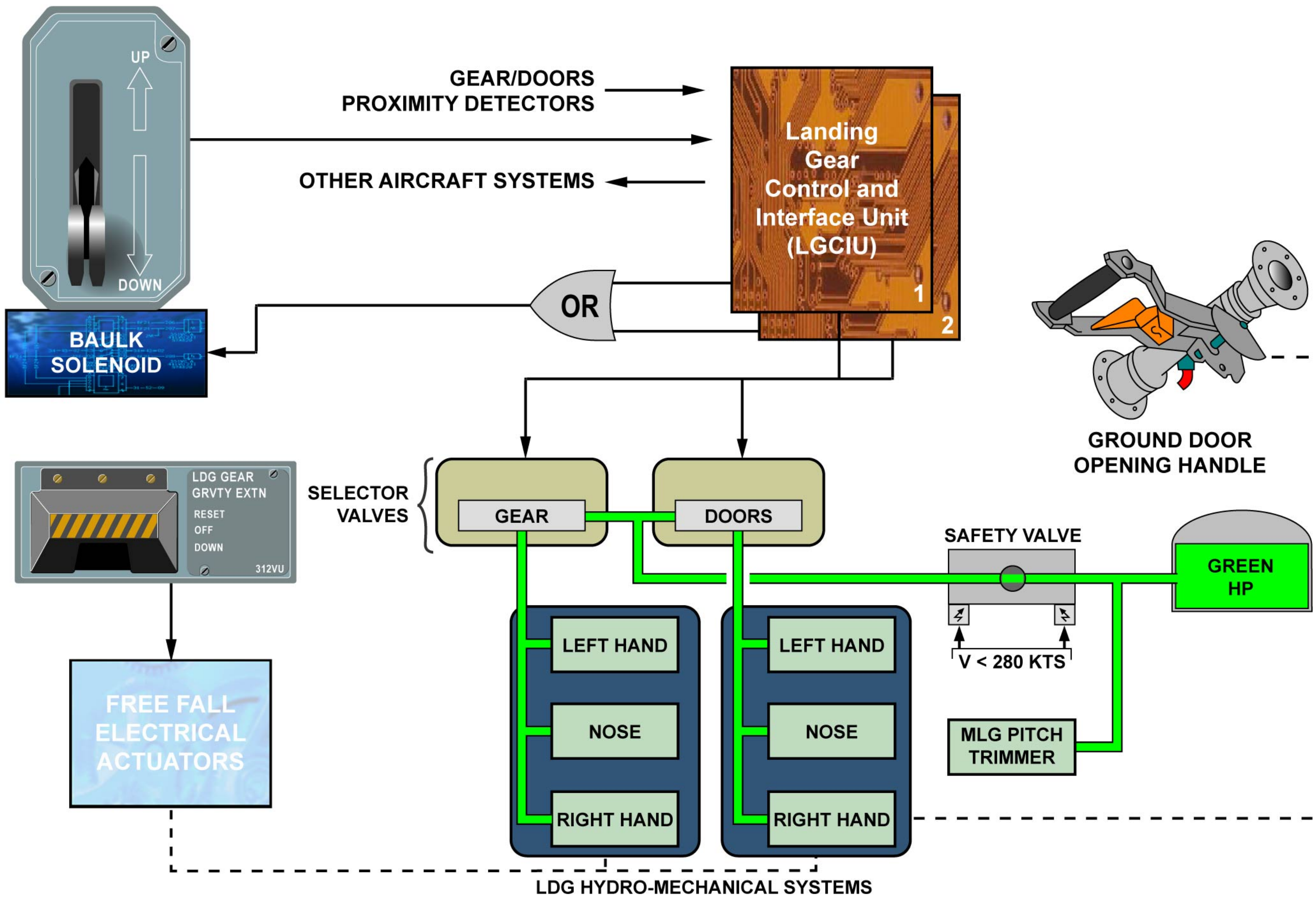
32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR EXTENSION AND RETRACTION

The extension/retraction system comprises:
- the normal operation system,
- the free fall extension system,
- the door ground opening system.

L/G normal operation is controlled through a lever located on the landing control panel. The L/G control lever has two positions only:
- the UP position for the retraction sequence,
- the DOWN position for the extension sequence.

Each Landing Gear Control and Interface Unit (LGCIU) controls one complete cycle: One UP and DOWN selection. An interlock mechanism controls a lever baulk solenoid to prevents unsafe retraction when the L/G is not in flight conditions. The LGCIUs switch over automatically at each L/G retraction cycle or in case of sequencing system failure.
The L/G is powered by the green hydraulic system. At high air speed a safety valve cuts hydraulic supply to the L/G system. In turn, each LGCIU controls the selector valve manifold, which hydraulically operates all gears and doors. The two LGCIUs process gear position, sequencing information, gear lever selection and send landing status to other aircraft systems. In case of normal extension failure, the L/G can be extended by gravity through an electro-mechanical system. Its power supply is duplicated and is controlled by toggle switches on the main instrument panel. For maintenance functions, the system has a hydraulically operating system for the opening and closing of the L/G doors. The NLG ground opening system is located in the gear bay. The MLG doors ground opening system is located under the fuselage forward of the L/Gs.



LANDING GEAR EXTENSION AND RETRACTION

G6B08031 - G10T4T0 - FM32P8000000003

32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR EXTENSION AND RETRACTION (continued)

NLG NORMAL RETRACTION SEQUENCE

For the normal retraction sequence, the L/G lever must be on the UP position to get gears and doors retraction. The cockpit crew knows that the gears are retracted and the doors closed through the L/G position on the LanDinG GEAR panel or on the ECAM WHEEL page.

LANDING GEAR EXTENSION AND RETRACTION - NLG NORMAL RETRACTION SEQUENCE

32 LANDING GEAR SYSTEM PRESENTATION (1)

LANDING GEAR EXTENSION AND RETRACTION (continued)

MLG NORMAL RETRACTION SEQUENCE

For the normal retraction sequence, the L/G lever must be on the UP position to get gears and doors retraction. The cockpit crew knows that the gears are retracted and the doors closed through the L/G position on the LDG GEAR panel or on the ECAM WHEEL page.

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LANDING GEAR EXTENSION AND RETRACTION - MLG NORMAL RETRACTION SEQUENCE

32 LANDING GEAR SYSTEM PRESENTATION (1)

BRAKING

Only the MLG wheels are installed with multi disks carbon brakes. Each brake assembly is activated by two separated sets of pistons powered by different hydraulic systems. There are three braking modes that can independently operate the brake units:
- normal braking,
- alternate braking,
- parking/ultimate emergency braking.

NORMAL BRAKING

The normal braking system is used to decrease the speed of the aircraft when it moves on the ground and to stop the rotation of the MLG wheels before landing gear retraction. The normal braking system has an automatic or manual mode of braking operation, which automatically gives an Anti-Skid (A/SKID) protection for individual wheels. In manual mode, a differential braking is possible according to the left and right brake pedals position. The Braking and Steering Control Unit (BSCU) computes the A/SKID protection and compares the speed of each individual MLG wheel with the actual aircraft speed. Setting the Anti/SKID & Nose/Wheel STeeRinG switch to the ON position prepares the BSCU for normal brakes operation. The normal braking system is electrically controlled and hydraulically operated by the green hydraulic power.

NORMAL BRAKING MANUAL MODE

In manual mode, the aircraft on ground, with the braking pedals operating, the related braking inputs are sent to the BSCU, which energizes the normal selector valve to connect the green hydraulic power to the system. A pressure switch measures the hydraulic pressure in the system and supplies the data to the BSCU. The automatic selector, operated by the hydraulic pressure, lets the green system supply the normal brakes and cuts the blue hydraulic pressure.

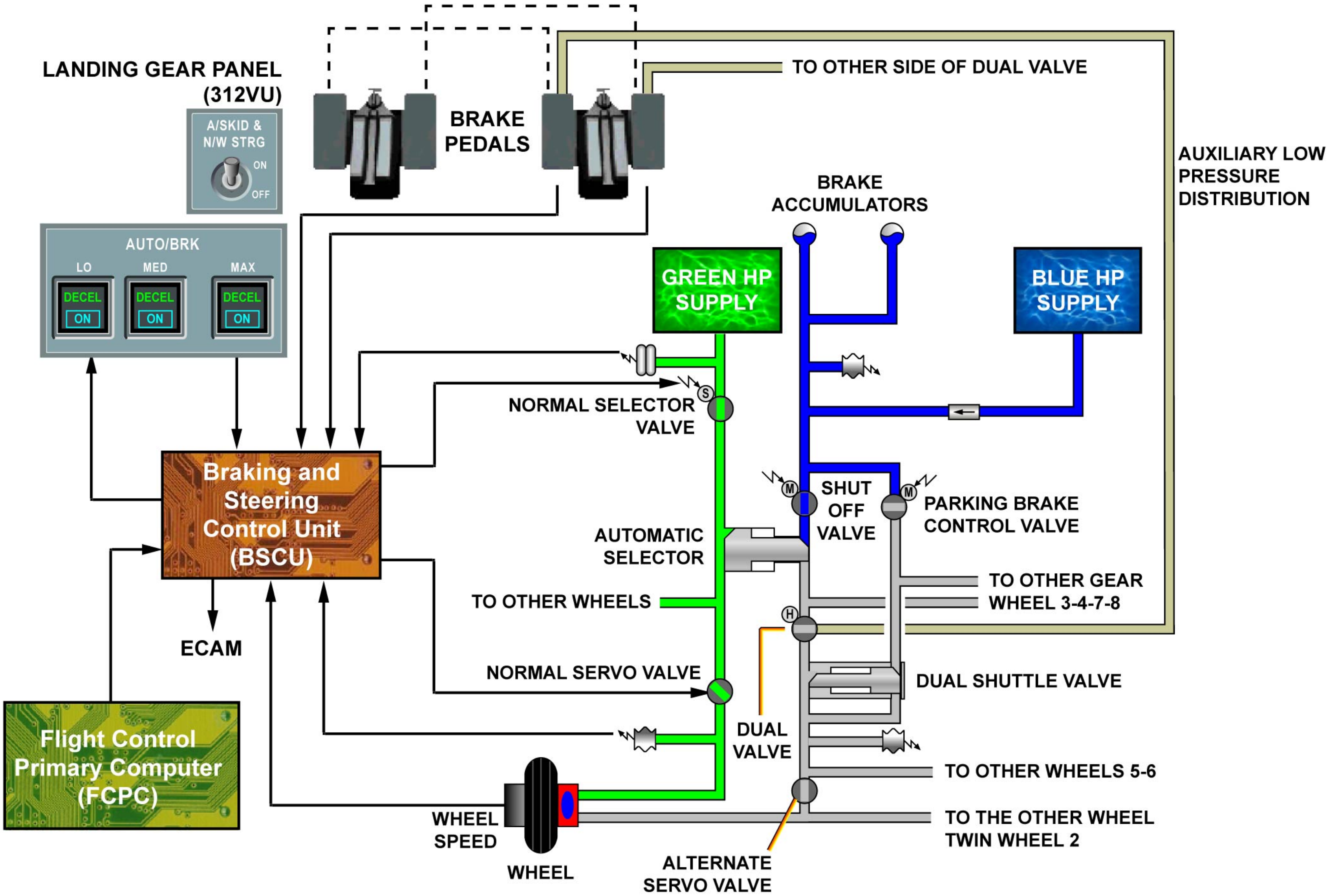
When both hydraulic systems are available, by its internal design, the automatic selector gives priority to the green system. The servo valve, controlled by the BSCU, modulates the hydraulic pressure sent to the brakes according to the pedals demand and the A/SKID protection. Wheel rotation speed and braking pressure values are fed back to the BSCU for braking and A/SKID computation. The BSCU sends data to the WHEEL page.

NORMAL BRAKING AUTO BRAKE

Auto brake is available during a TO if an aborted TO is necessary or at landing. Before TO, the auto brake is armed by pressing the MAximum P/B on the AUTO/BRaKe control panel. Then the automatic braking will be activated by the ground spoilers extension command from the Flight Controls Primary Computers (FCPCs). The MAX mode gives the maximum available braking without delay and should be selected only for TO. Two automatic braking modes are available during a, LOw and MEDium landing. Pressing the related P/B on the AUTO/BRK makes the selection control panel. Activation of the auto brake is started after deployment order of the ground spoilers from the FCPC. When the auto brake is activated, the normal braking is working the same way as in manual control but the braking inputs are generated according to the selected deceleration. The auto brake will be disarmed if at least one brake pedal is deflected over a defined threshold or by selecting change or loss of arming conditions.

NORMAL BRAKING IN FLIGHT BRAKING

Before the MLG start to move during retraction sequence, the braking is automatically activated during few seconds to stop the rotation of the MLG wheels. The in flight braking is controlled by the BSCU using the normal brake system. At the end of the gear retraction, the NLG wheels rotation is stopped by mechanical brake pads.



BRAKING - NORMAL BRAKING ... NORMAL BRAKING IN FLIGHT BRAKING

32 LANDING GEAR SYSTEM PRESENTATION (1)

BRAKING (continued)

ALTERNATE BRAKING

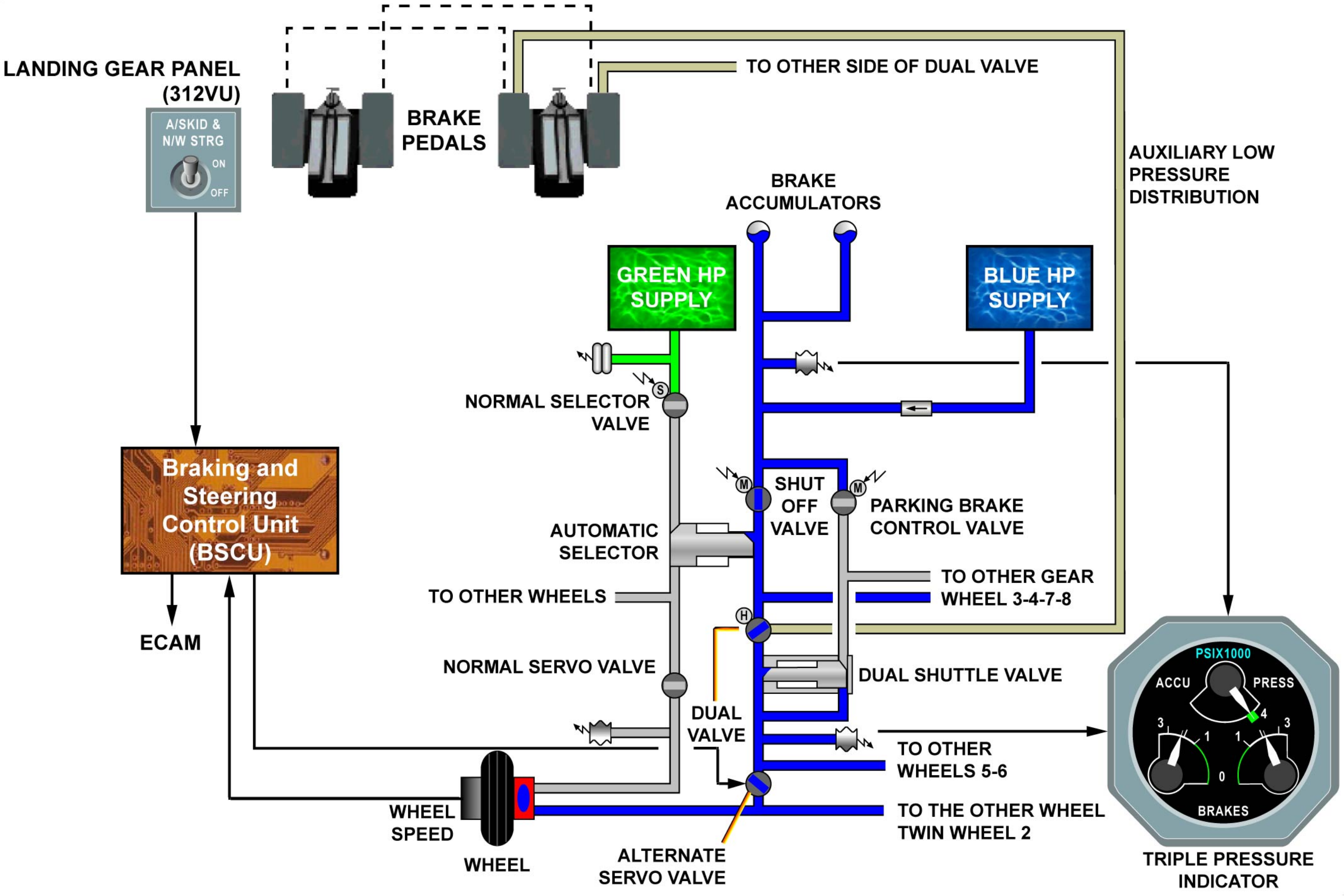
The alternate braking system is an hydro mechanical braking system. It is manually operated to decrease the speed of the aircraft when it moves on the ground. The alternate braking system automatically takes over if a failure occurs in the normal braking system or in case of green hydraulic system low pressure. It can operate with A/SKID or without A/SKID. The alternate braking system is controlled by the auxiliary low-pressure distribution and hydraulically operated by the blue hydraulic power.

ALTERNATE BRAKING WITH ANTI-SKID

The BSCU controls only the A/SKID function in the alternate braking system when the normal braking system is not available. The BSCU de-energizes the normal selector valve. The AUTO brake is lost. The automatic selector valve operates and lets blue system pressure go into the alternate braking system. Control of the alternate braking system is achieved by the pedals only, through the auxiliary low pressure distribution control system. The blue pressure is regulated via the dual valve. The BSCU sends A/SKID closing signals to the alternate servo valve. The pressure delivered to the left hand and right hand brakes as well as the blue accumulator pressure are indicated on the blue pressure triple indicator.

ALTERNATE BRAKING WITHOUT ANTI-SKID

Alternate braking without A/SKID becomes automatically active when the A/SKID function is lost due to BSCU failure or if the blue hydraulic power is not available and the system is powered by the brake accumulators only. The pedals only achieve the control of the alternate braking system through the auxiliary low pressure distribution control system. The blue pressure is regulated via the dual valve. When the A/SKID function is lost, the alternate servo valves are left fully open. The pressure delivered to the left hand and right hand brakes as well as the blue accumulator pressure are indicated on the blue pressure triple indicator. The pressure given by the brake accumulators is sufficient to give a minimum of 7 full applications of the brake pedals. When the alternate braking without A/SKID is used, the brake pressure has to be limited by the pilot to avoid wheel locking. With the aircraft in flight (LGCIU signal) and a low blue hydraulic system pressure the shut-off valve, isolates the supply between the accumulators and the automatic selector to avoid depressurization of the brake accumulators due to internal leaks within the alternate braking system.



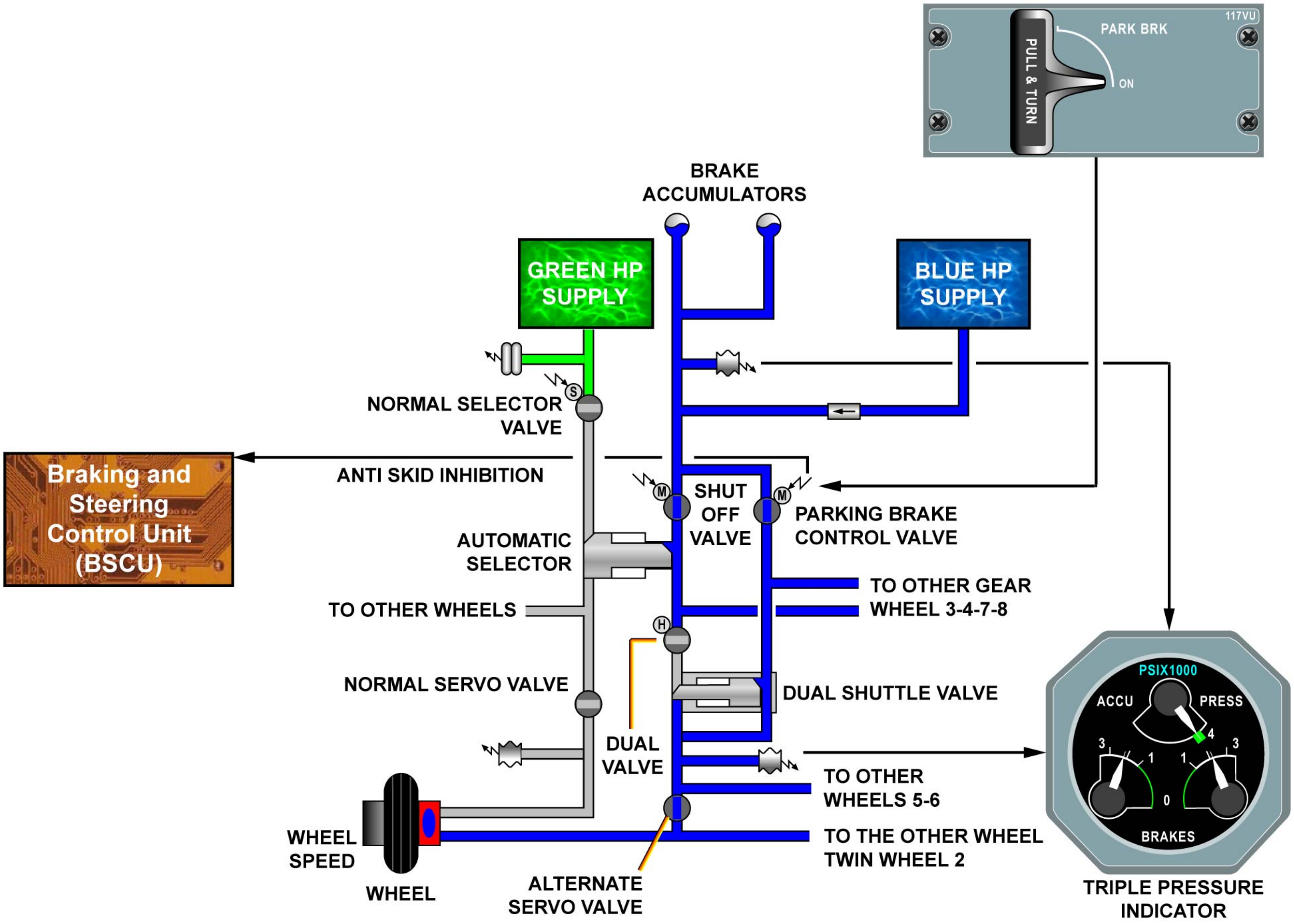
BRAKING - ALTERNATE BRAKING ... ALTERNATE BRAKING WITHOUT ANTI-SKID

32 LANDING GEAR SYSTEM PRESENTATION (1)

BRAKING (continued)

ALTERNATE BRAKING PARKING BRAKE

The parking/ultimate emergency braking system is an electro-hydraulic system. Its function is to prevent movement of the aircraft when it is parked. This system is electrically controlled and hydraulically operated by the blue hydraulic power or by the blue pressure brake accumulators. The parking/ultimate emergency braking system can also be used in an emergency braking mode to stop the aircraft when no other braking mode is available. When the PARKing BRaKe handle is set to ON, the parking brake control valve is activated and connects the blue pressure to the system. The dual shuttle valve, operated by the hydraulic pressure, connects the blue pressure to the fully opened servo valves and closes the supply downstream of the dual valve to isolate the brake pedals. The park brake control valve sends a signal to the BSCU to isolate the other braking systems. When the PARK BRK handle is set to OFF, the parking brake control valve cuts the blue pressure, the dual shuttle valve re-opens the hydraulic supply from the dual valve. The triple pressure indicator shows the available pressure from the brake accumulators. It also shows the pressure applied on the MLG brakes. This pressure is limited by the system to 2.580 psi. The accumulators have sufficient capacity to hold the brakes on for a minimum time of twelve hours.



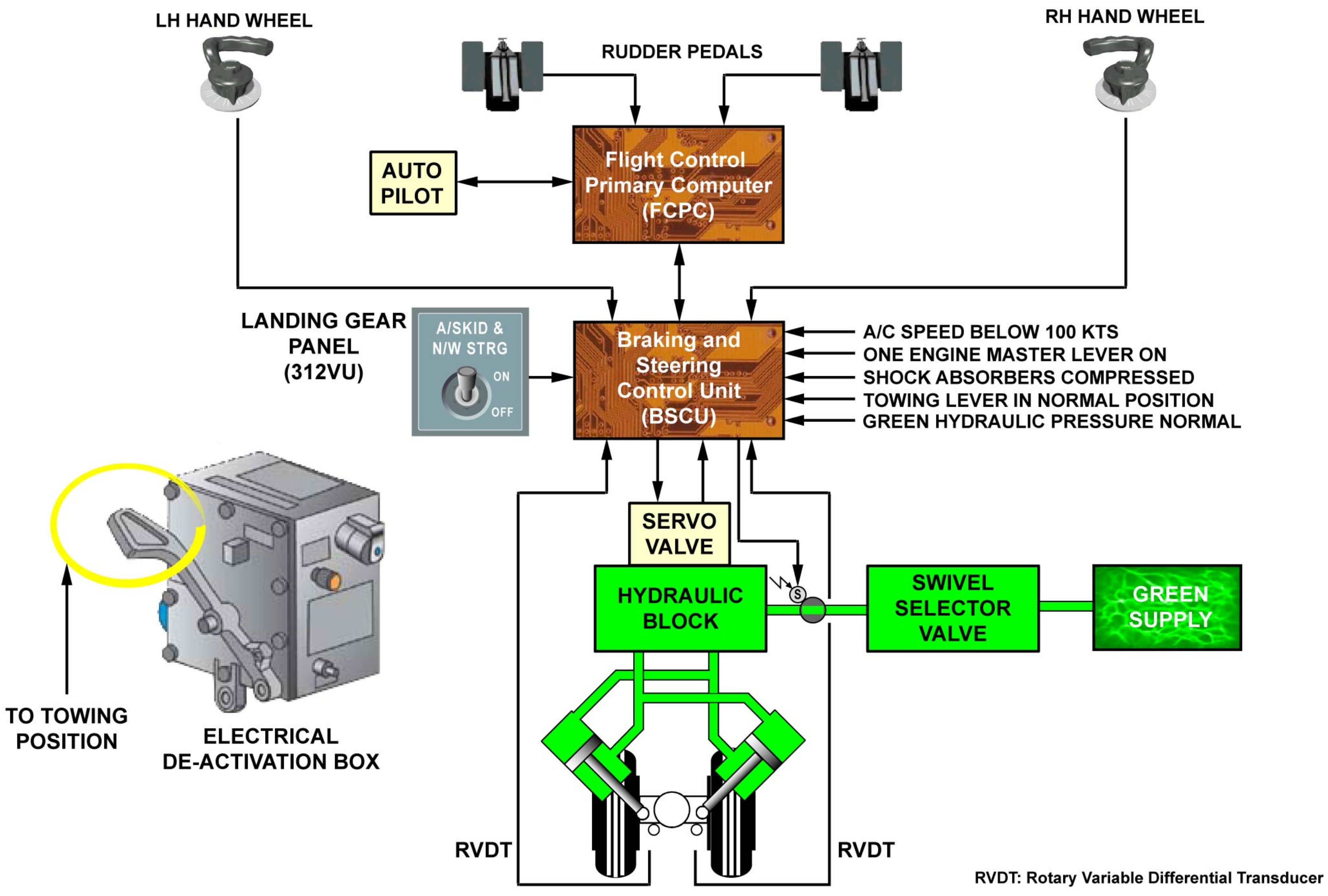
BRAKING - ALTERNATE BRAKING PARKING BRAKE

32 LANDING GEAR SYSTEM PRESENTATION (1)

STEERING

The nose wheel steering system is used to change the direction of the aircraft when it moves on the ground with engine power. It is electrically controlled by the BSCU and hydraulically operated by the green hydraulic power. The BSCU activates the nose wheel steering system by opening the selector valve as soon as all the following specified conditions are available:
- the aircraft speed is below 100 kts,
- one MASTER lever "ON",
- the shock absorbers are compressed,
- the towing lever is in the normal position,
- the green hydraulic pressure is normal,
- the A/SKID & N/W STRG switch is set to ON.

The green hydraulic pressure supplies the system through the swivel selector valve when the NLG is fully downlocked. The servo valve controls the hydraulic pressure to the steering actuators depending on the BSCU steering inputs. Two independent Rotary Variable Differential Transducers (RVDTs) send the angular position of the nose wheels to the BSCU. The BSCU transmits data to the ECAM, monitors the system components and transmits the data to the Central Maintenance Computer (CMC). A lever on the electrical de-activation box can be set in the towing position. This cancels all the steering outputs from the BSCU to the steering system and prevents damage during towing.

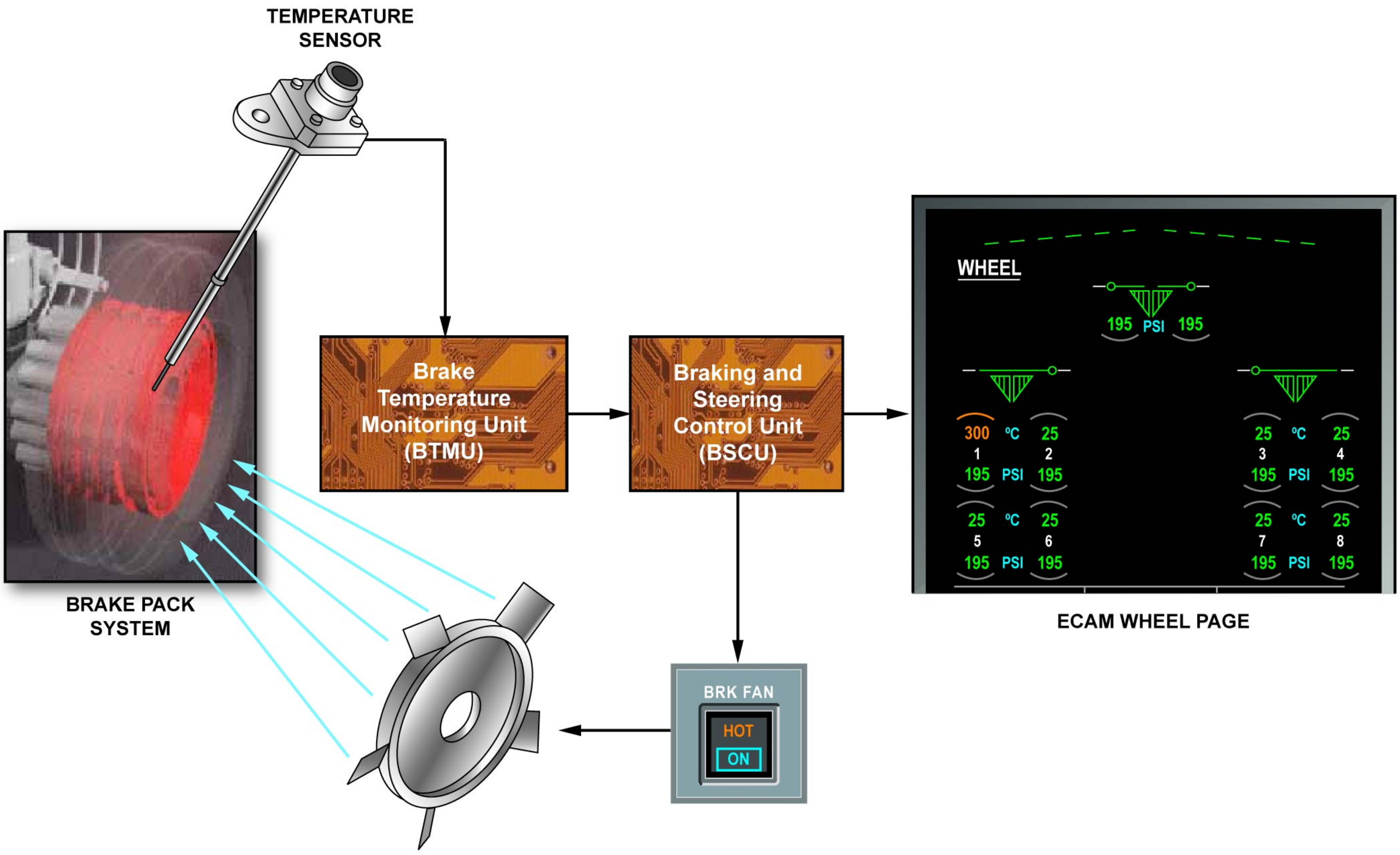

LH HAND WHEEL
RUDDER PEDALS
RH HAND WHEEL
AUTO PILOT
Flight Control Primary Computer (FCPC)
LANDING GEAR PANEL (312VU)
A/SKID & N/W STRG
ON
OFF
Braking and Steering Control Unit (BSCU)
A/C SPEED BELOW 100 KTS
ONE ENGINE MASTER LEVER ON
SHOCK ABSORBERS COMPRESSED
TOWING LEVER IN NORMAL POSITION
GREEN HYDRAULIC PRESSURE NORMAL
SERVO VALVE
HYDRAULIC BLOCK
SWIVEL SELECTOR VALVE
GREEN SUPPLY
TO TOWING POSITION
ELECTRICAL DE-ACTIVATION BOX
RVDT
RVDT
RVDT: Rotary Variable Differential Transducer

STEERING

32 LANDING GEAR SYSTEM PRESENTATION (1)

BRAKE TEMPERATURE AND COOLING

Each brake pack assembly has a temperature sensor connected to a Brake Temperature Monitoring Unit (BTMU). The BTMU sends data to the BSCU. Brakes temperature data and warnings are displayed on the ECAM WHEEL page and on the BRK FAN pushbutton. An electrical fan assembly installed on the wheel axle and manually controlled from the cockpit can cool down the brake pack on demand.



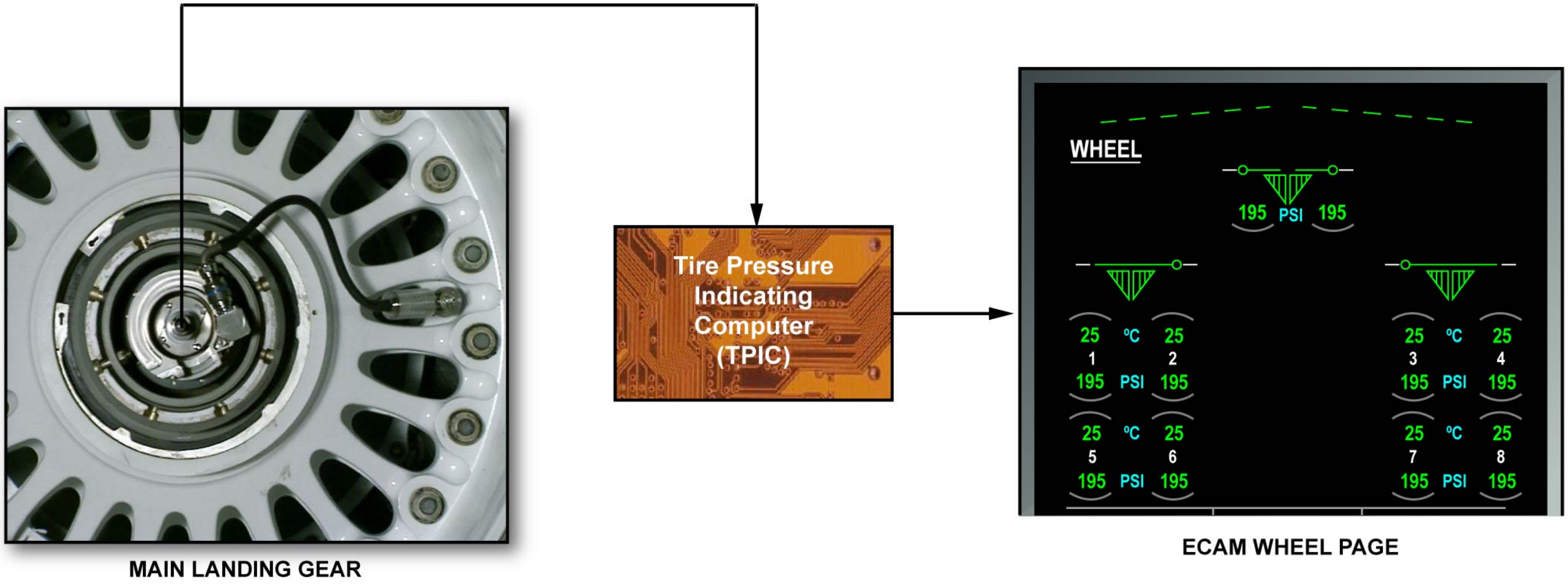
G6B08031 - G10T4T0 - FM32P8000000003

BRAKE TEMPERATURE AND COOLING

32 LANDING GEAR SYSTEM PRESENTATION (1)

TIRE PRESSURE INDICATING SYSTEM

The TPIS includes an electronic pressure sensor on each wheel and a Tire Pressure Indicating Computer (TPIC). The TPIC controls and monitors the operation of the system and sends data to the ECAM.



TIRE PRESSURE INDICATING SYSTEM

32 LANDING GEAR SYSTEM PRESENTATION (1)

CONTROL AND INDICATING

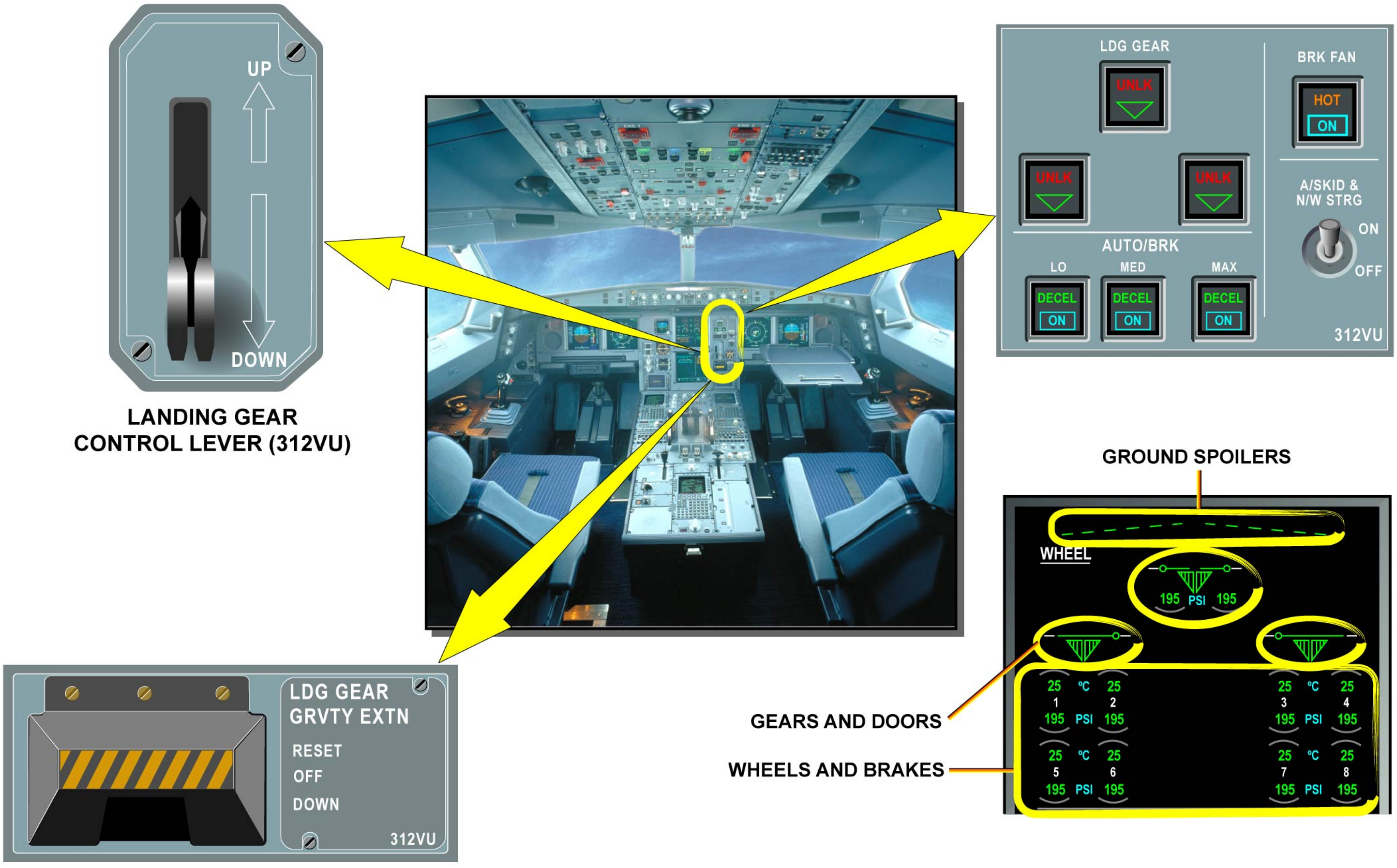
This section will highlight the control panels and indications for the landing gear system.

LANDING GEAR/BRAKES

The landing gear system has various control panels and indications located in the cockpit:
- the L/G control lever,
- the LDG GEAR GRaViTY EXTeNsion panel and,
- the L/G panel.

The L/G panel includes:
- the LDG GEAR position indication panel,
- the AUTO/BRK mode selection,
- the BRK FAN P/B,
- the A/SKD & N/W STRG switch.

The ECAM WHEEL page displays indications for the landing gear system.



CONTROL AND INDICATING - LANDING GEAR/BRAKES

32 LANDING GEAR SYSTEM PRESENTATION (1)

CONTROL AND INDICATING (continued)

INDICATOR, PARKING BRAKE HANDLE, RUDDER PEDALS

The landing gear system also has in the cockpit:
- the triple pressure indicator for brake accumulator pressure and alternate/parking brake pressure,
- the parking brake handle,
- the rudder/brake pedals.

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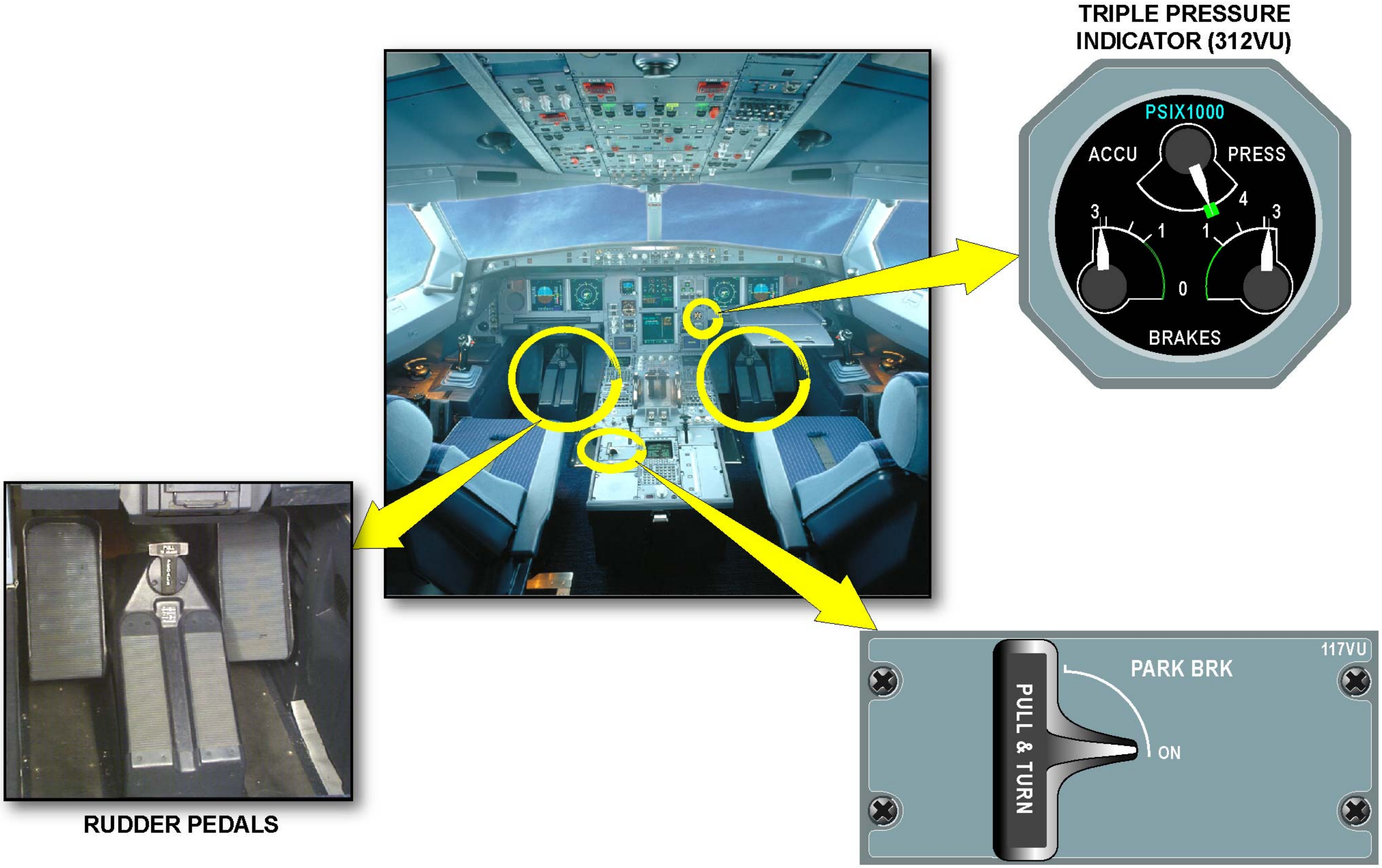

CONTROL AND INDICATING - INDICATOR, PARKING BRAKE HANDLE, RUDDER PEDALS

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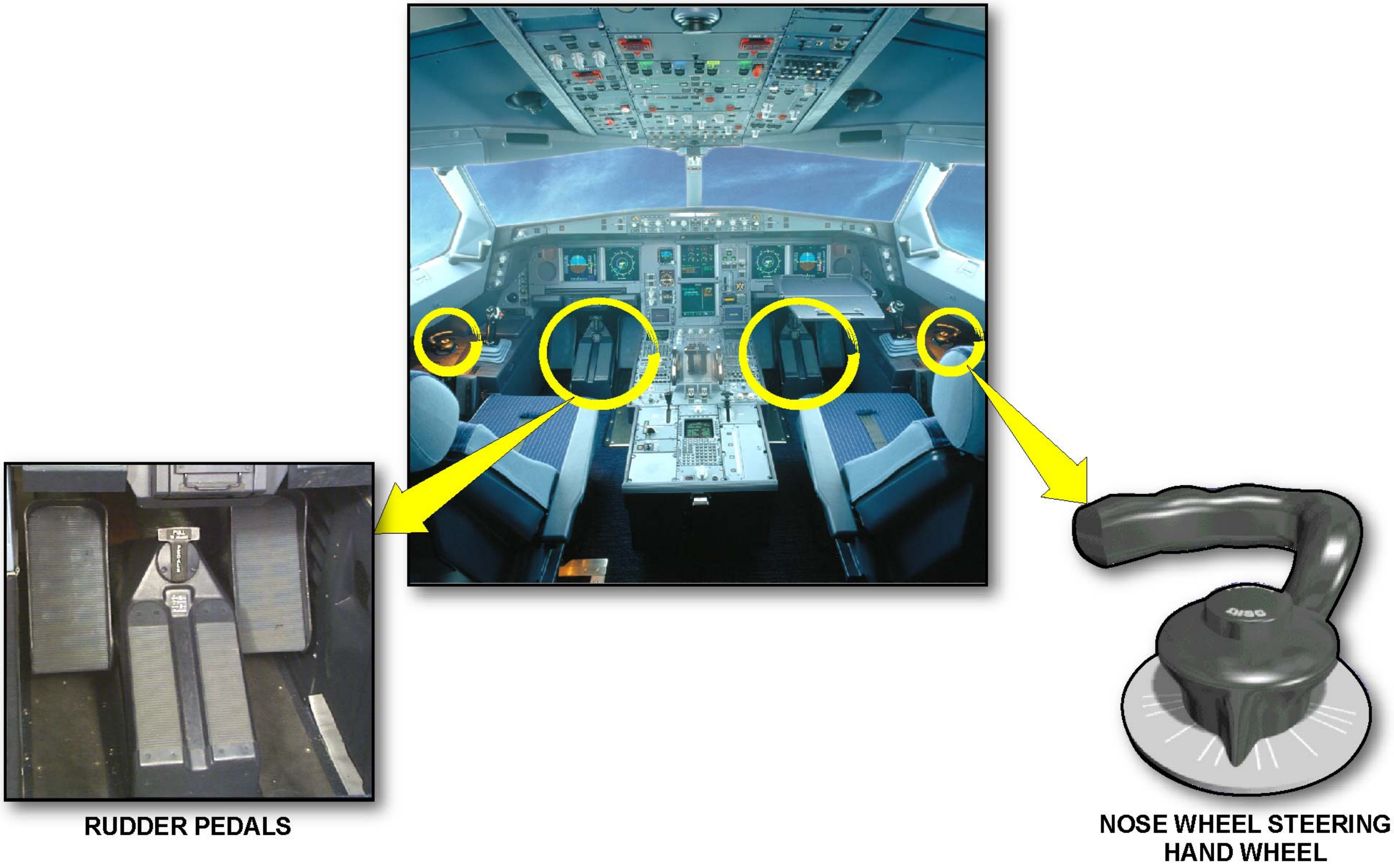
32 LANDING GEAR SYSTEM PRESENTATION (1)

CONTROL AND INDICATING (continued)

NOSE WHEEL STEERING

The nose wheel steering control is done through:
- rudder/steering pedals,
- nose wheel steering hand wheels.

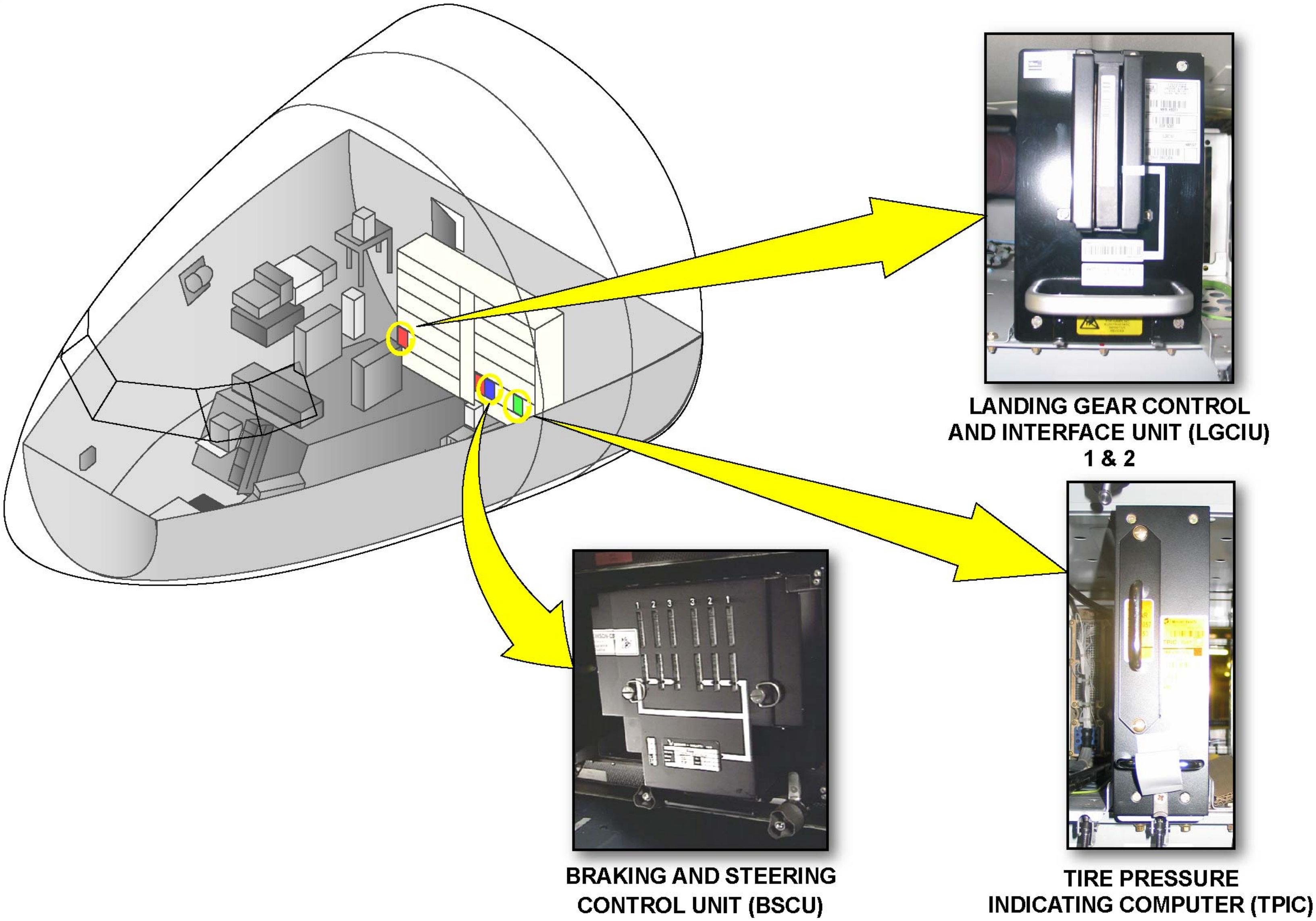


CONTROL AND INDICATING - NOSE WHEEL STEERING

32 LANDING GEAR SYSTEM PRESENTATION (1)

COMPONENT LOCATION

The LGCIU, the BSCU and the TPIC are located in the avionics compartment.



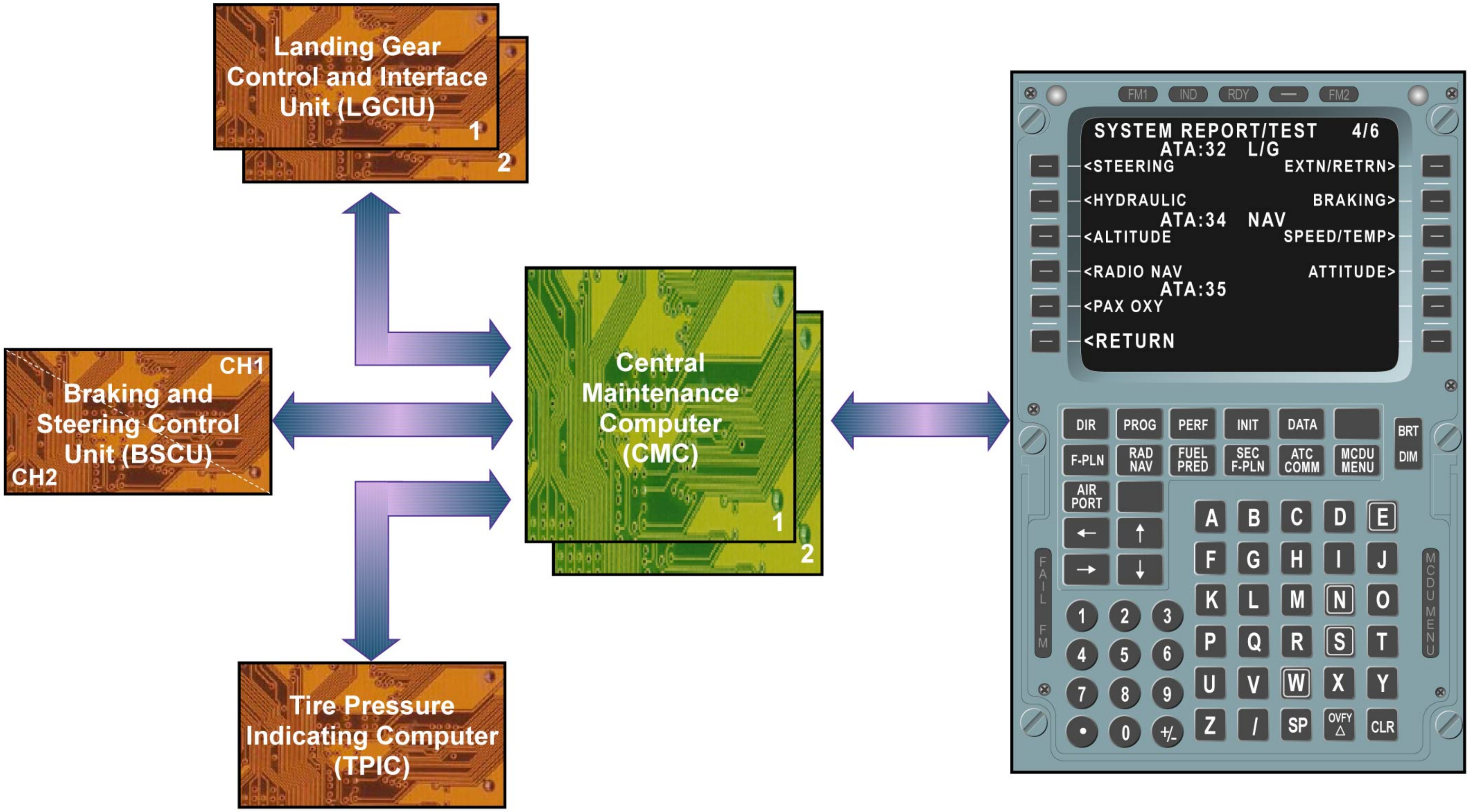
COMPONENT LOCATION

G6B08031 - G10T4T0 - FM32P8000000003

32 LANDING GEAR SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

Each L/G computer has a BITE which tests, manages and records failures to help the maintenance operations.



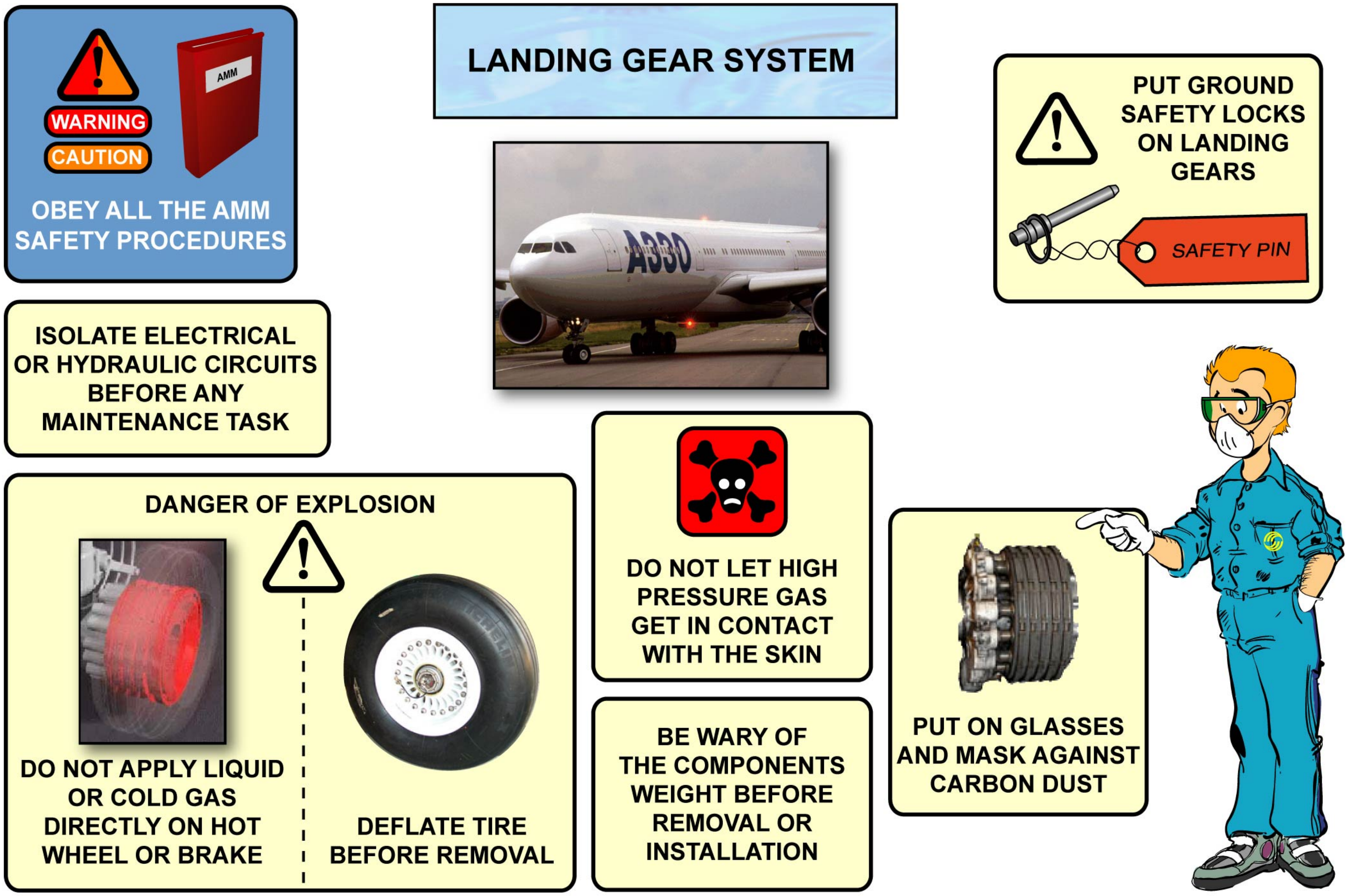
G6B08031 - G10T4T0 - FM32P8000000003

MAINTENANCE/TEST FACILITIES

32 LANDING GEAR SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

When working on the L/G system, you must obey all the AMM safety procedures. This will prevent injury to persons and/or damage to the aircraft. The main safety precautions relative to the L/G system are:
- make sure that all circuits are isolated during any maintenance task. Unwanted electrical or hydraulic power can be dangerous,
- make sure that the travel ranges of the L/G and doors are clear. Movement of the L/G and doors can cause injury and/or damage,
- make sure that the wheel chocks are in position and the L/G ground safety locks are installed. This prevents unwanted movement of the aircraft or L/G,
- let the brakes and the wheels become cool before going near the L/G. Do not apply a liquid or gas fire extinguisher directly on a hot wheel or brake unit. This could cause an explosion,
- deflate the tire before removing the wheel. This prevents a possible explosion,
- before removal or installation of a component, make sure that a man can hold it because some components are heavy. If one falls, it can cause injury to persons and damage to equipment,
- during L/G servicing, do not let high pressure gas get in contact with the skin. Gas bubbles in the blood can kill a man,
- during work near the wheel brakes, use safety glasses and a mask. Carbon brake dust can cause irritation to the eyes or lungs.



SAFETY PRECAUTIONS

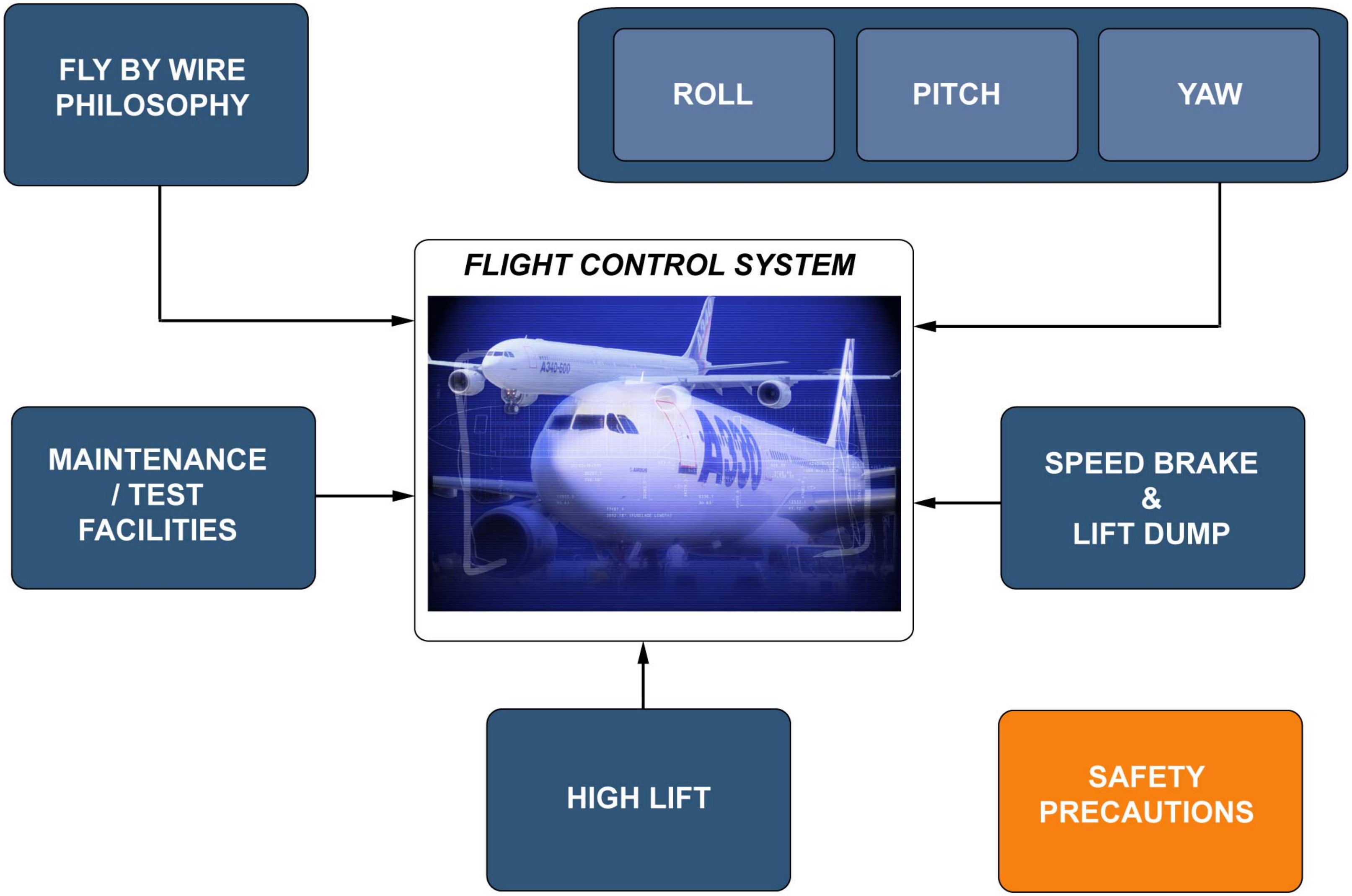
G6B08031 - G10T4T0 - FM32P8000000003

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

INTRODUCTION

The fly by wire flight control system controls:
- the primary flight controls which control the pitch, roll and yaw axis,
- the secondary flight controls which include the speed brakes and ground spoilers (Lift dumping),
- the high lift function which includes the flaps and slats .

The flight control system is monitored by the Onboard Maintenance System (OMS) for maintenance and troubleshooting functions. When doing maintenance on the aircraft, all safety procedures listed in the Aircraft Maintenance Manual (AMM) must be applied.
Let's see their location on the A/C.



INTRODUCTION

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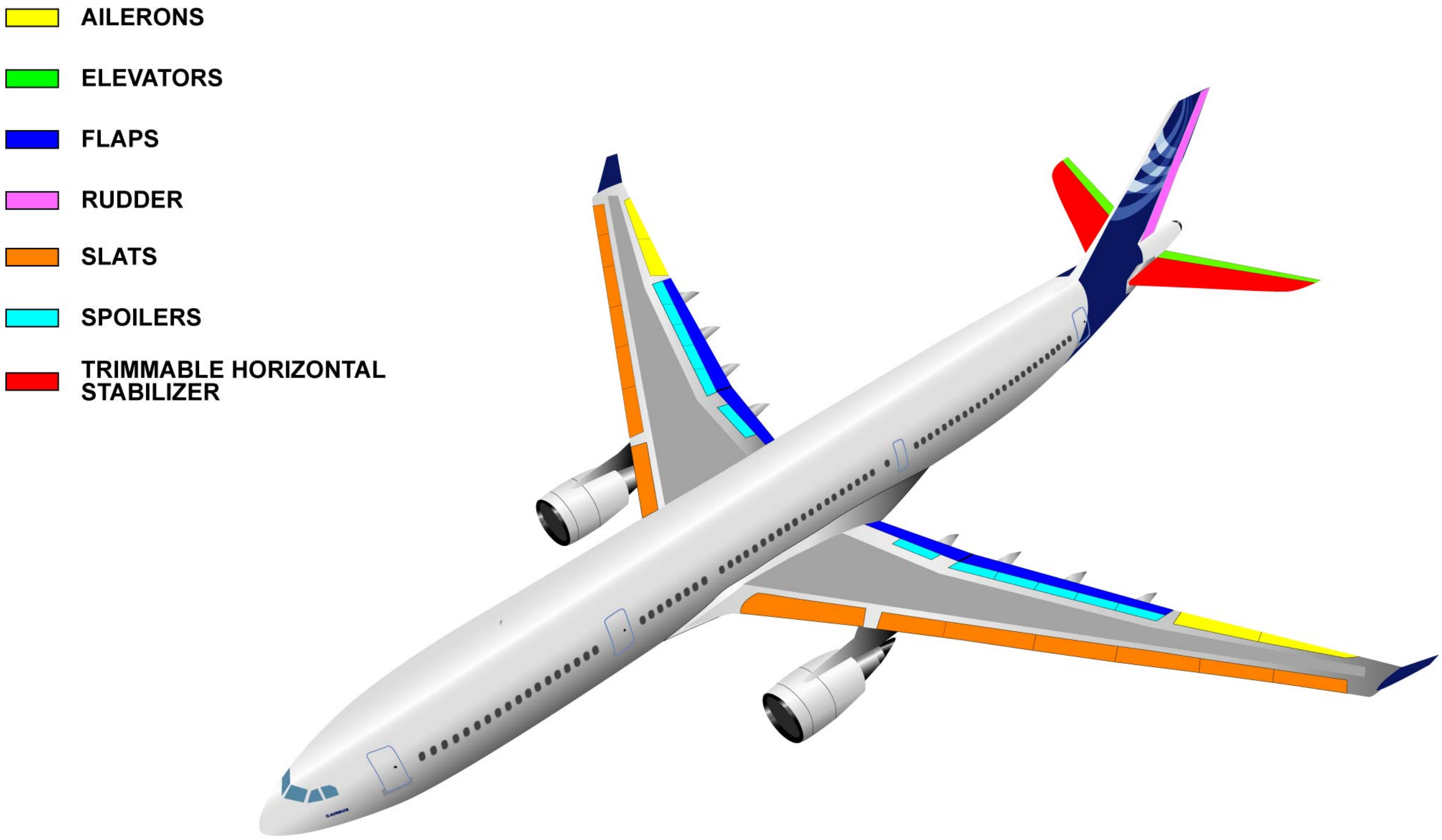

Flight control surfaces are identical on A330 and all A340.

INTRODUCTION

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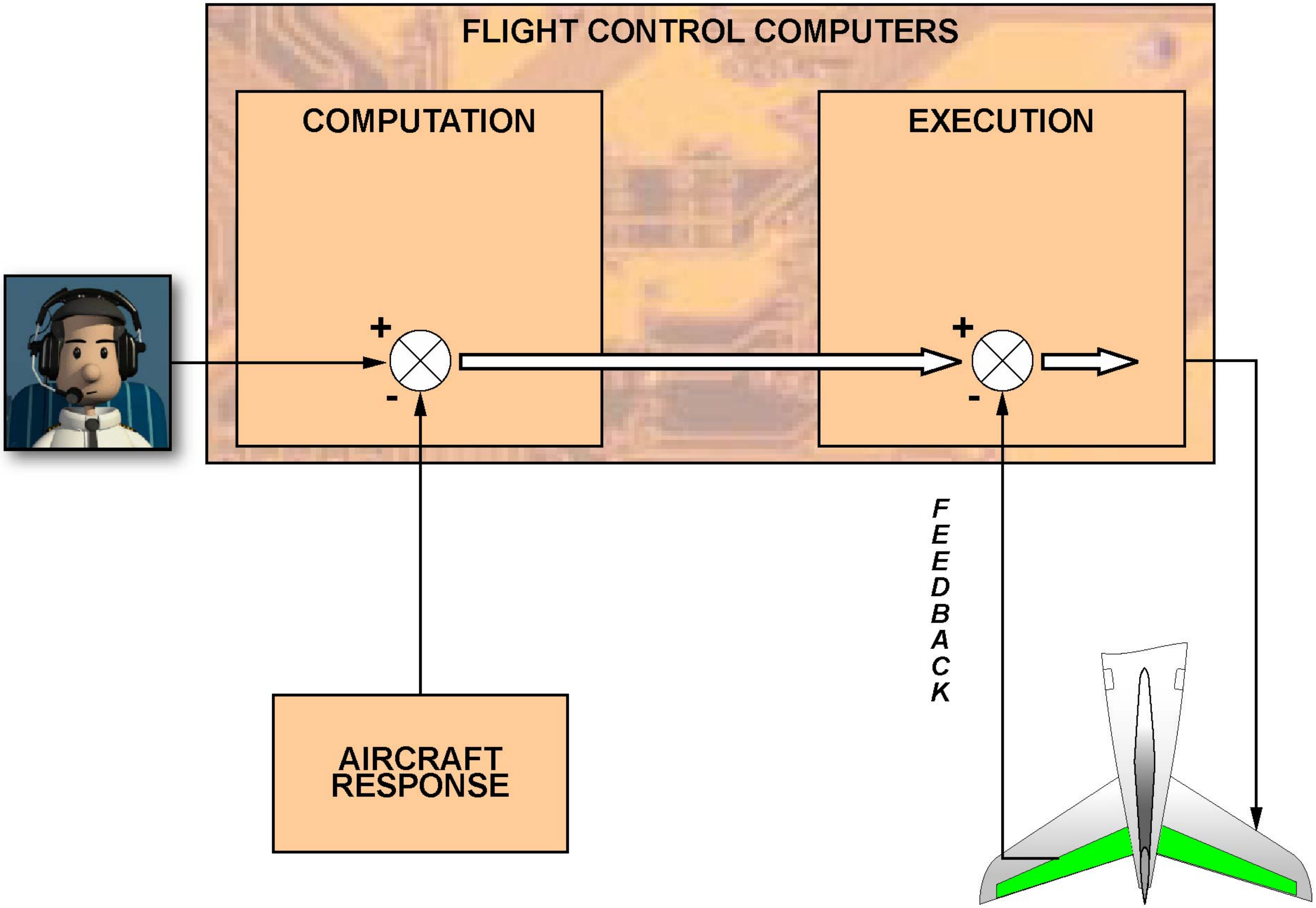
27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

FLY BY WIRE PRINCIPLE

The relation between the pilot input on the side stick and the aircraft response is called control law. The pilot's side stick orders are sent to the flight control computers. The computers elaborate the control law surface deflection orders. An electrical command signal is sent to the related surfaces servo actuator. The aircraft response feedback is sent back to the flight control computers and compared to the pilot orders. The fly by wire design requires the aircraft to be servo-looped.

NOTE: Note: Side stick electrical command signals are sent to the computers, which elaborate surface deflection orders and send electrical command signals to servo-actuators to move surfaces. It replaces the mechanical link found on conventional aircraft flight control systems.



FLY BY WIRE PRINCIPLE

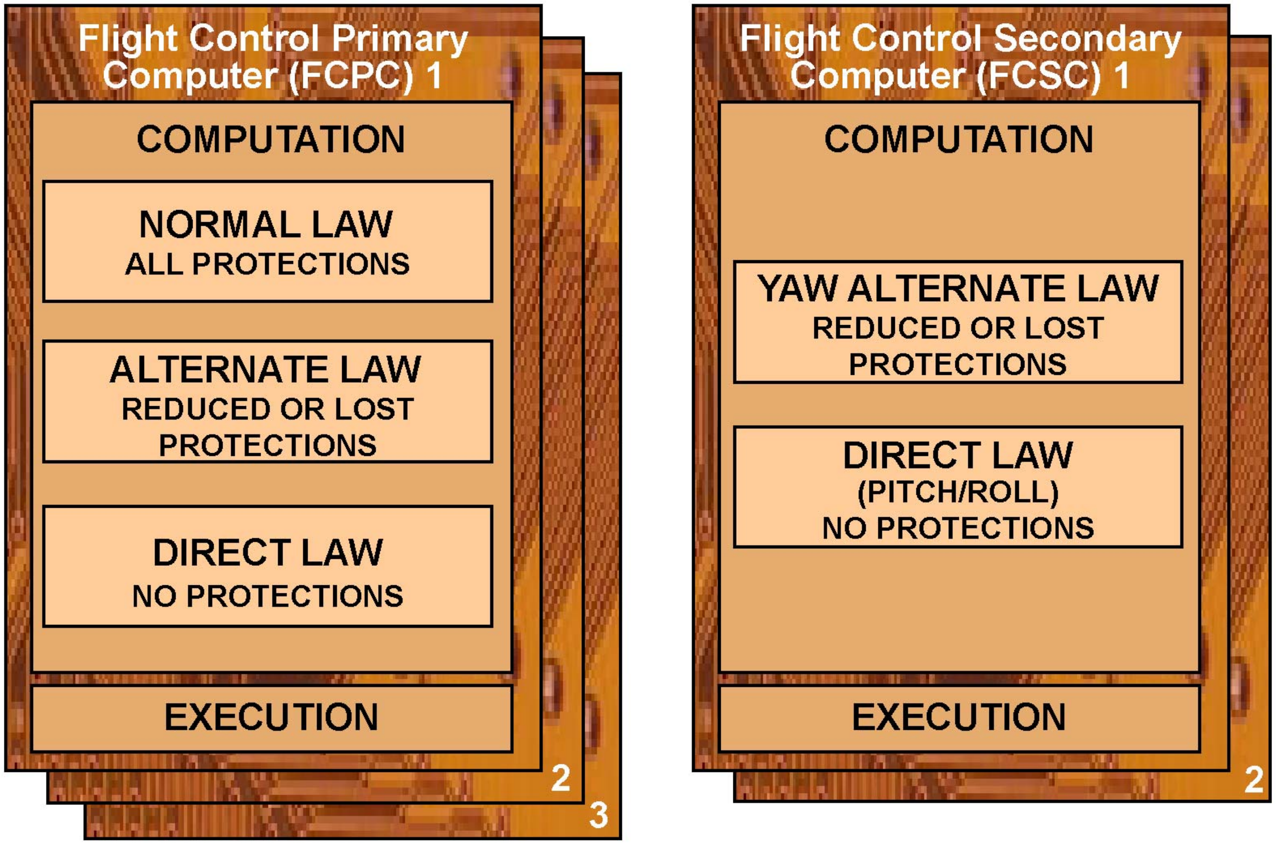
27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

FLIGHT CONTROL LAWS

The deflection orders are processed by the flight control system according to different control laws. The aircraft is controlled in all axes through:
- the pitch control law,
- the lateral control law (roll and yaw).

Depending on the status of the flight control system or other systems (number of computers available, status of peripheral components and sensors) three different sets of control laws can be engaged:
- the normal law, with all protections,
- the alternate law, with reduced protections,
- the direct law, without protections.

Control laws automatically switch from normal to alternate or direct according to the nature and number of failures. After loss of normal laws, the reconfiguration of control laws is different for the pitch axis and for the lateral axis.
The normal law is only implemented in the FCPCs. The FCSCs can only compute the yaw alternate law and the direct law.



FLIGHT CONTROL LAWS

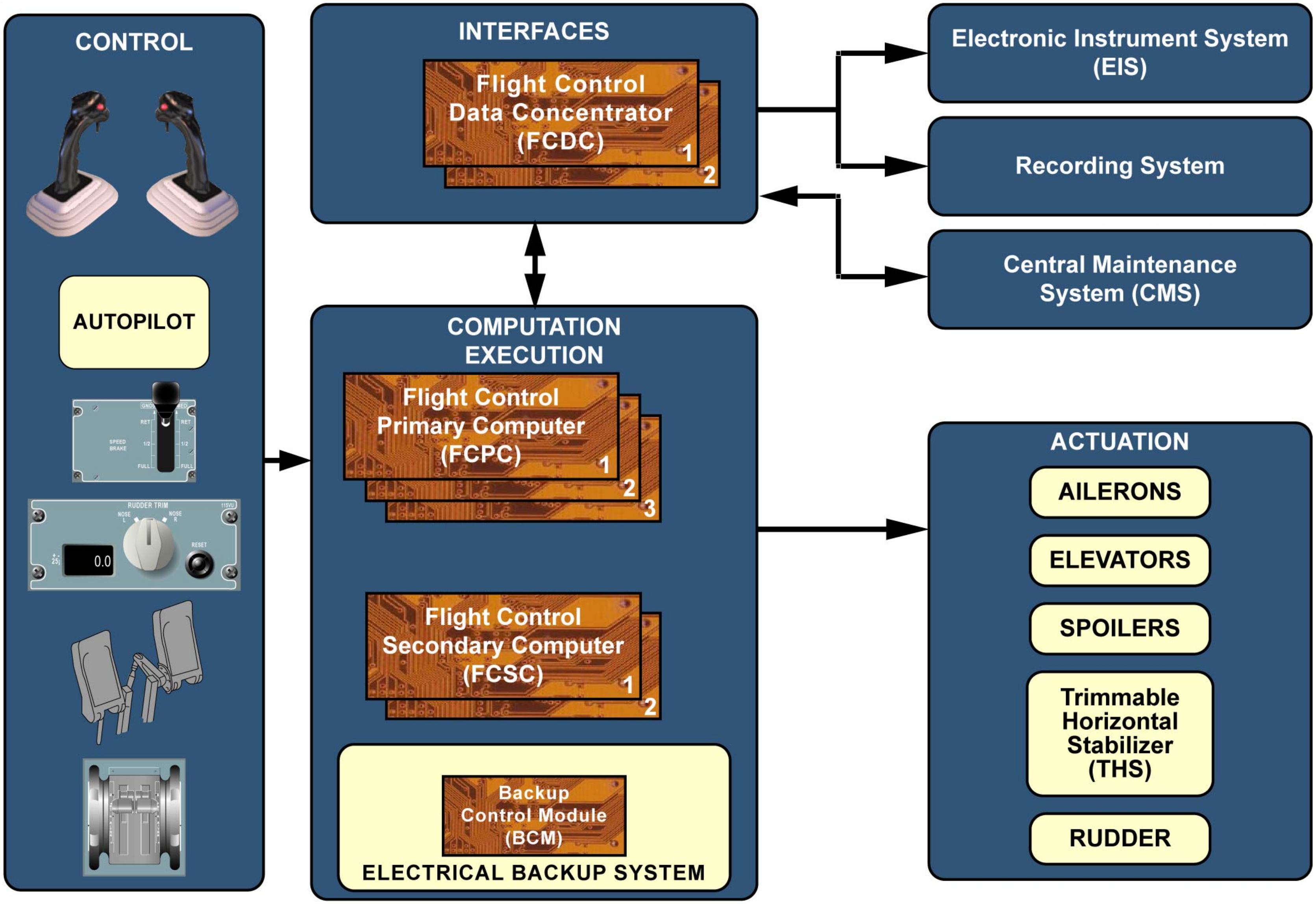
27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

FLIGHT CONTROLS ARCHITECTURE

The three FCPCs, also called "PRIM", and the two FCSCs, also called "SEC", receive pilot orders from:
- the side sticks,
- the rudder pedals,
- the rudder trim control panel
- the speed brake control lever.

The FCPCs receive autopilot inputs from the Flight Management Guidance and Envelope Computers (FMGECs). The FCPCs and FCSCs interface together. They control and monitor:
- the ailerons,
- the spoilers,
- the elevators,
- the rudder.

The THS is controlled by the FCPCs only. The THS can also be mechanically operated through the trim wheel. In case of loss of the FCPCs and FCSCs, the Backup Control Module (BCM) controls the aircraft yaw via the rudder. The two Flight Control Data Concentrators (FCDCs) interface the FCPCs and FCSCs with:
- the Electronic Instrument System (EIS),
- the Centralized maintenance system (CMS),
- the recording system.



FLIGHT CONTROLS ARCHITECTURE

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

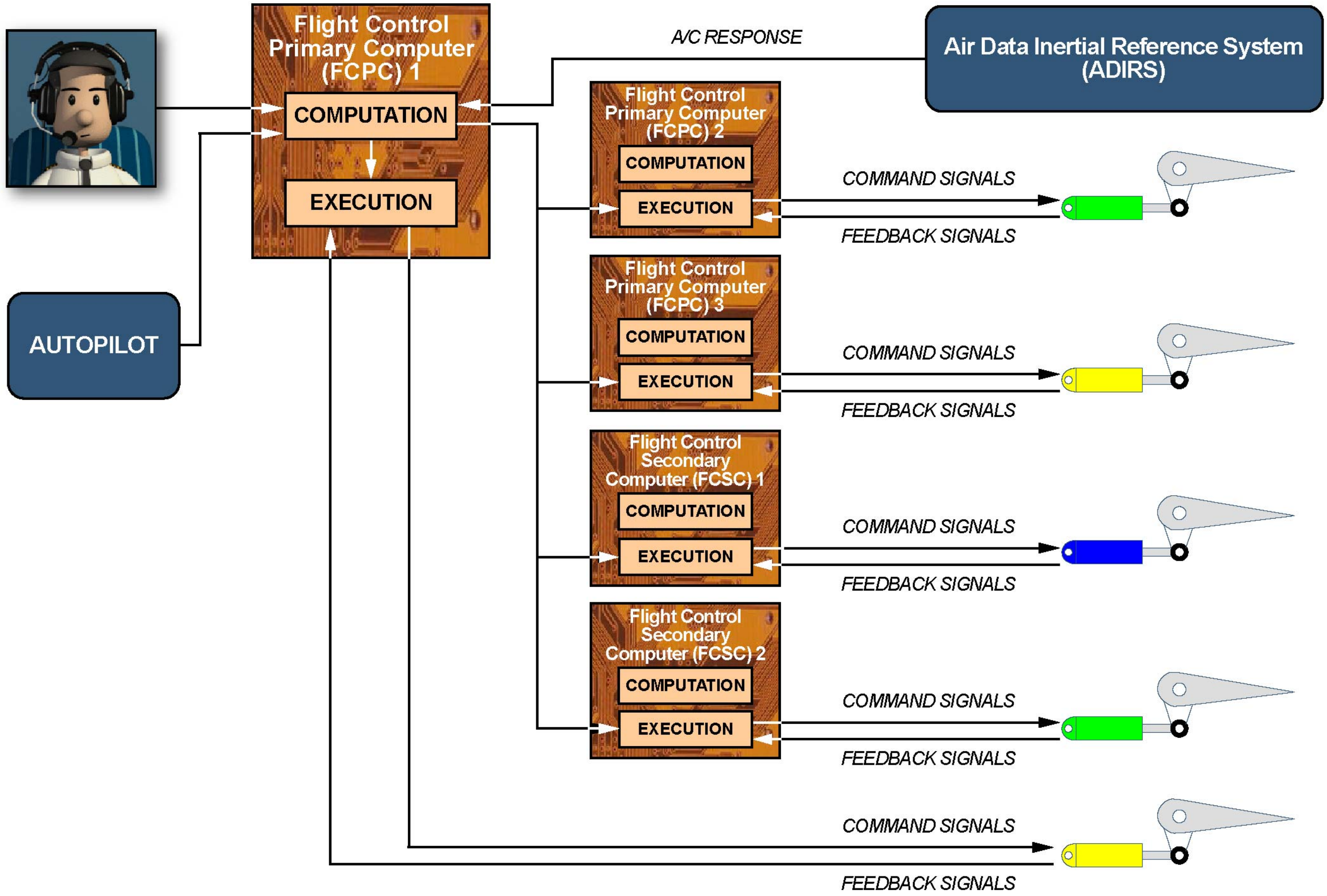
FLIGHT CONTROLS ARCHITECTURE (continued)

COMPUTER MASTER / SERVO LOOP CONFIGURATION

The 3 FCPCs and the 2 FCSCs fulfill two functions:
- the computation part which elaborates the surface deflection orders,
- the execution part which fulfills the servoing of the deflection orders.

One computer only (FCPC 1 in normal configuration) is the master. This computer generates the deflection orders and transmits them to the other computers. The five computers signal their related surfaces and fulfill the servo loop controls.
Each computer establishes the highest level of law that can be engaged according to its internal monitoring and the availability of ADIRUs, control signals, surface actuation and the positions of the THS, the flaps and the slats.
The computer which has the highest level of law, and according to the computer priority, is the master for law computation: normally FCPC 1, then FCPC 2 and 3.
Among the computers which can engage the highest level of law, the computer having the top priority is chosen.

NOTE: Note: the priority logic for law engagement is totally independent from the servo-loop engagement logic.



FLIGHT CONTROLS ARCHITECTURE - COMPUTER MASTER / SERVO LOOP CONFIGURATION

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

ACTUATION RECONFIGURATION PRIORITY

ACTUATORS

The actuators are hydraulically powered by one of the three hydraulic circuits, except the THS servo-motors which are electrically driven.
Roll control is done by the one inboard and one outboard aileron on each wing and the roll spoilers (spoilers 2 through 6). The aileron droop function is provided by all the ailerons. The ailerons are deflected downwards when the flaps are extended to follow the contours of the wing. The aileron droop function increases the lift on the part of the wing with no flaps.
The pitch control is done by the elevators and by the Trimmable Horizontal Stabilizer (THS). The trim wheel can also mechanically control the hydraulic motors. The trim wheel has priority over the electrical control. The mechanical control is used:
- on ground, for setting the THS take-off trim,
- in flight, as a back-up system if THS electrical control is lost.
The rudder fulfills the yaw control. The Pedal Feel and Trim Unit (PFTU) gives rudder pedal artificial feel, trim function and feedback movement.
The Backup Control Module(BCM) is an electronic module, which fulfills the yaw control in case of flight control computer failures. The Backup Power Supplies (BPSs) supply electrical power to the BCM from two hydraulically driven motors. The BCM transmits the rudder pedals order to the rudder, and also fulfills dutch roll damping. The PFTU interfaces the BCM with the pedals.
All spoilers fulfill the speed brake function. All the spoilers fulfill the ground lift dump function when specific ground logic conditions are fulfilled.

COMPUTERS

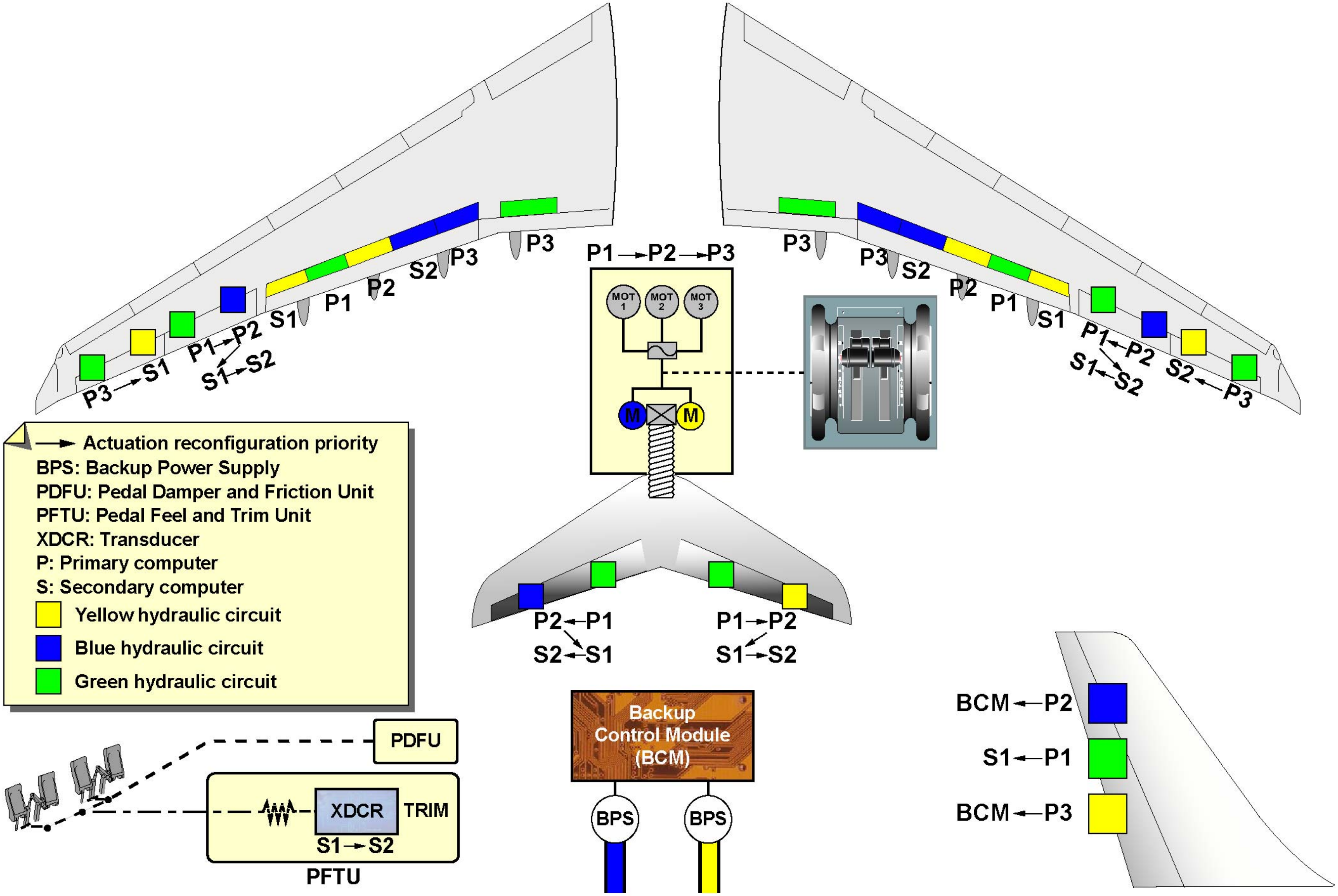
The relationship between actuators and computer is indicated on the schematic.

PRIORITY SERVOCONTROLS

There are two servo controls for each aileron and elevator surface. In normal configuration, one servo control actuates the surface. It is called priority servo control and is in active mode. The second, which follows the surface deflection, is in damping mode.
A third mode called re-centering sets the surfaces in neutral position in case of specific failures (for elevators on all A330, 340 and also inboard ailerons for A340-500/600).
There are three servo controls for the rudder. Alls are active at the same time.
There is only one servo control per spoiler.

RECONFIGURATION PRIORITIES

In normal configuration, the following computers ensure the servoloop control. The arrows indicate the actuation reconfiguration priorities in case of either electrical failure, computer failure or loss of hydraulic circuits.



ACTUATION RECONFIGURATION PRIORITY - ACTUATORS ... RECONFIGURATION PRIORITIES

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

CONTROLS

All the controls for the flight controls are located in the cockpit.

SIDE STICK

The two side sticks are used for manual pitch and roll control. They are spring loaded to neutral position. Each side stick has a P/B used for Autopilot (AP) disconnection and to take priority over the other side stick.

SPEED BRAKE LEVER

The speed brake lever controls the position of the speed brake surfaces and pre selection of the ground spoiler function. The lever has to be pushed down and placed in the required position. To arm the ground spoilers for automatic extension, the lever must be pulled up when in the retracted position.

THS CONTROL

The THS is automatically trimmed during flight. After touch down, the THS is automatically trimmed to nose up position. The THS mechanical control is used to set the pitch trim before take-off or when the automatic pitch trim is not available. Trim position is indicated in degrees on a scale adjacent to each trim wheel.

RUDDER PEDALS

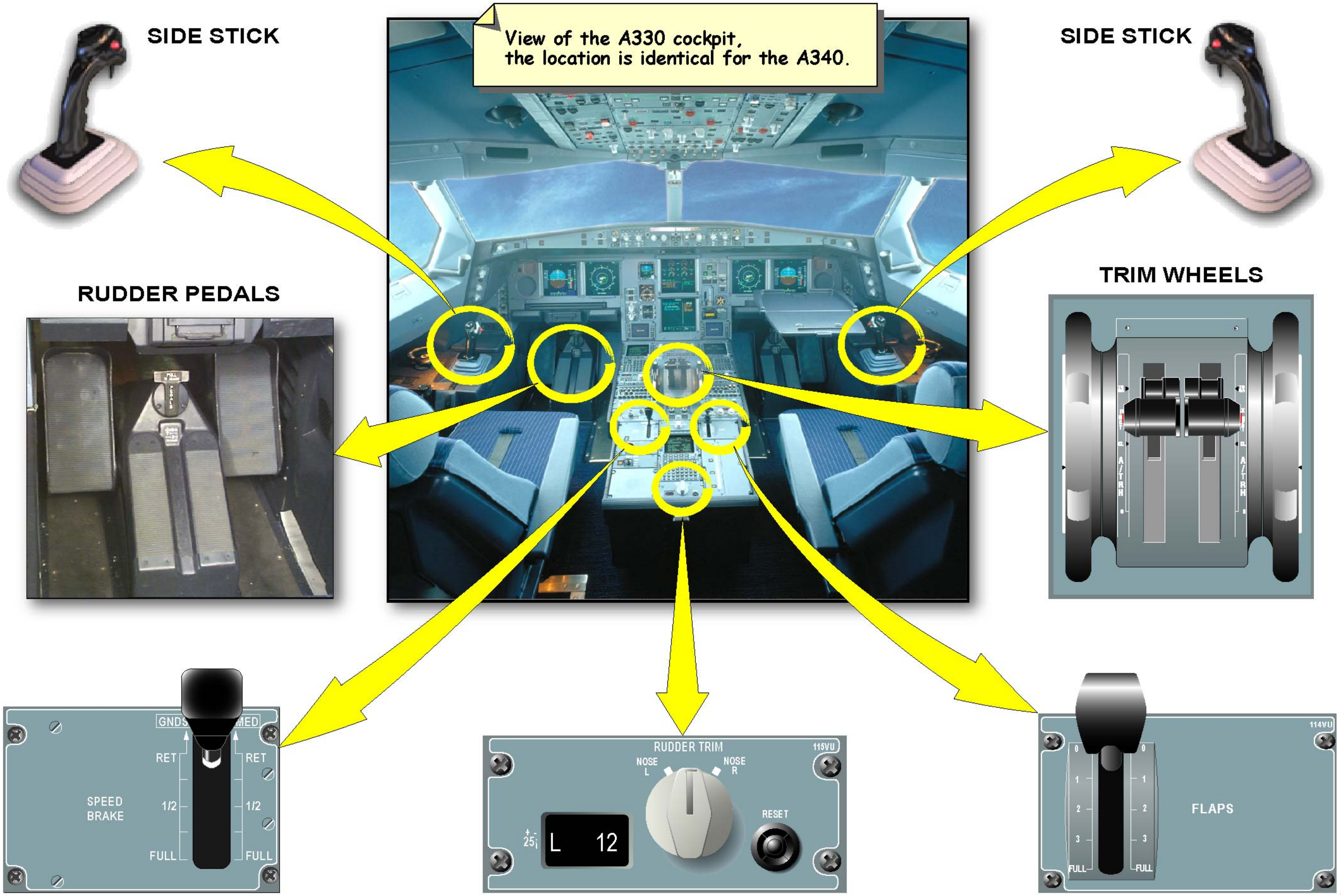
Two sets of pedals enable the rudder electrical control. The pedals can be individually adjusted.

RUDDER TRIM

The rudder trim control switch sends signal to FCSCs to move the rudder to a new neutral position and to the PFTU, which moves the rudder pedals for feedback. The rudder trim RESET P/B resets the trim position to zero. The rudder trim indicator displays rudder trim position in degrees.

FLAP CONTROL LEVER

The flap control lever selects simultaneous operation of slats and flaps. It has five positions.



CONTROLS - SIDE STICK ... FLAP CONTROL LEVER

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27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

INDICATING

All the indicators for the flight controls are located in the cockpit.

FLIGHT CONTROL PANELS

The computer P/Bs are used to energize, de-energize and reset the flight control computers. FAULT or OFF/Reset legend can be indicated.

SIDE STICK PRIORITY LIGHTS

The side stick priority lights in front of each pilot, indicate who has taken and who has lost priority.

ECAM PAGES

The flight control system uses three ECAM pages:
- F/CTL ECAM page for primary surface indication,
- WHEEL ECAM page for ground spoiler indication,
- EWD for slat/flap indication.

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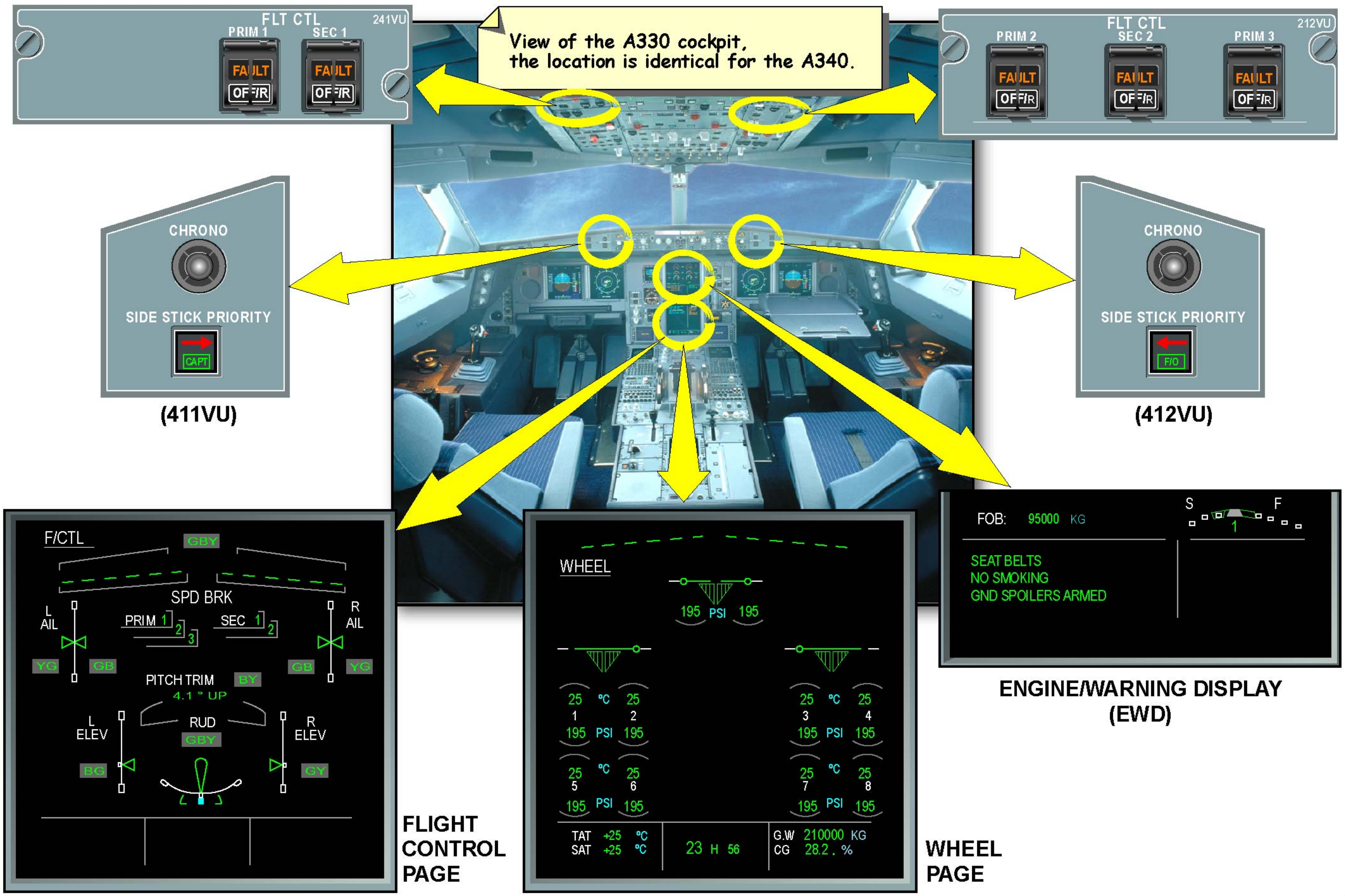


INDICATING - FLIGHT CONTROL PANELS ... ECAM PAGES

G6B08031 - G10T4T0 - FM27P5000000001

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

SLAT AND FLAP SYSTEM

ARCHITECTURE

The flaps and slats are hydro-mechanically operated and electrically controlled by the SFCCs. The position of the surfaces is selected from a 5 positions control lever that transmits the demand to the SFCCs. On lever demand, the SFCCs send signals to the slat and flap Power Control Units (PCUs). Two hydraulic motors on each PCU provide actuation. Each of them is powered by a different hydraulic system and has its own valve block and Pressure-Off Brake (POB). The valve blocks, that receive signals from the SFCCs, control the direction of rotation and the speed of their related hydraulic motors. The hydraulic motors move the transmission through a differential gearbox. Then torque shafts and gearboxes transmit the mechanical rotary power to the rotary actuators, which drive the surfaces. Position Pickoff Units (PPUs) are used by the computers to control and monitor the system. Feedback PPUs (FPPUs) send signals concerning the PCU output shaft position, while Asymmetry PPUs (APPUs) send information about the surface actual position. In addition, signals sent from Instrumentation PPUs (IPPUs) are used for position indicating on the ECAM and TO warnings. The Wing Tip Brakes (WTBs) are applied when mechanical failures in the transmission shaft system have been detected.

SLAT/FLAP LEVER

Slat and flap positions are simultaneously selected using a single control lever located on the center pedestal. Moving the lever rotates the input shaft of the command sensor unit, which converts the mechanical demand into electrical signals for the SFCCs.

SLAT/FLAP CONTROL COMPUTER

Two SFCCs control and monitor the system. Each SFCC includes one slat and one flap channel. A cross talk makes the transfer of data between the SFCCs. On lever demand, each channel generates commands to energize its related PCU valve block and controls its related motor. With one SFCC inoperative, both slat and flap systems operate at half speed.

POWER CONTROL UNITS

Each PCU includes two separate hydraulic motors powered through an electrically-signaled valve block, which receives drive commands from the SFCCs. The motor output shafts on each PCU are coupled through a differential gearbox to drive the slat and flap mechanical transmission. A POB on each motor locks the transmission:
- when the selected position is reached,
- in case of hydraulic power failure.
If one motor is inoperative (i.e. hydraulic failure or SFCC failure), the remaining motor supplies full output torque at half speed.

POSITION PICK-OFF UNITS

A FPPU and an IPPU are mounted on each PCU. An APPU is installed at the end of the transmission system (torque tubes) on each wing. The IPPUs give slat/flap actual position data for indication on the ECAM through the Flight Warning Computer (FWC). The APPUs and FPPUs are used to monitor asymmetry, runaway or over speed conditions:
- asymmetry is detected on disagreement between the two APPU signals,
- runaway is detected by comparison of both APPU and FPPU signals,
- over speed is detected by any PPU.

WING TIP BRAKES

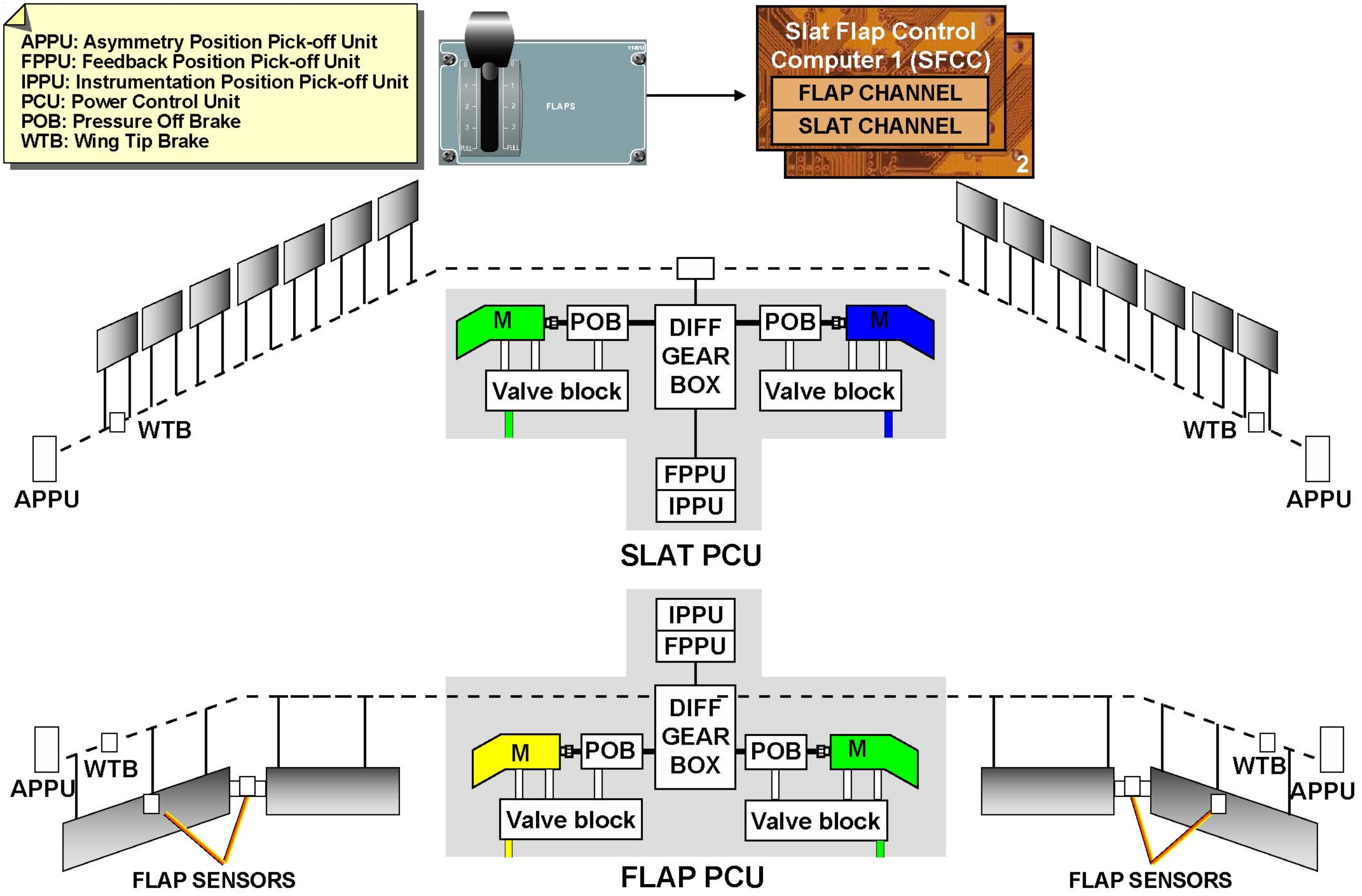
The WTBs stop and hold the transmission if the SFCCs detect some types of failures such as asymmetry, runaway or over speed. The WTBs are of the pressure-off type. Each WTB has two solenoid valves, each controlled by an SFCC and supplied by two hydraulic systems. They are released when hydraulic and electrical power is applied. In

normal flight conditions, the solenoids are permanently energized. The segregation of the two hydraulic circuits results in either one being able to keep the brake released. With one SFCC inoperative, the other SFCC is able to maintain the WTB released. Slat and Flap locking by the WTB are independent. Slat locking by the WTB does not prevent flap operation and vice versa. Once applied, the WTB can only be reset on ground via the Central Maintenance System (CMS).

FLAP SENSORS

A flap disconnect detection system inhibits further flap operation when a flap attachment failure is detected. It has two strut assemblies on each wing:
- the flap interconnecting strut sensors with their two proximity sensors,
- the flap track 4 strut sensors with their two proximity sensors.

They measure excessive differential movement between inner and outer flaps. If a flap disconnect is detected by the SFCC through one of the strut sensor assemblies, the flap PCU is de-energized and the POBs are applied in order to stop the transmission.



SLAT AND FLAP SYSTEM - ARCHITECTURE ... FLAP SENSORS

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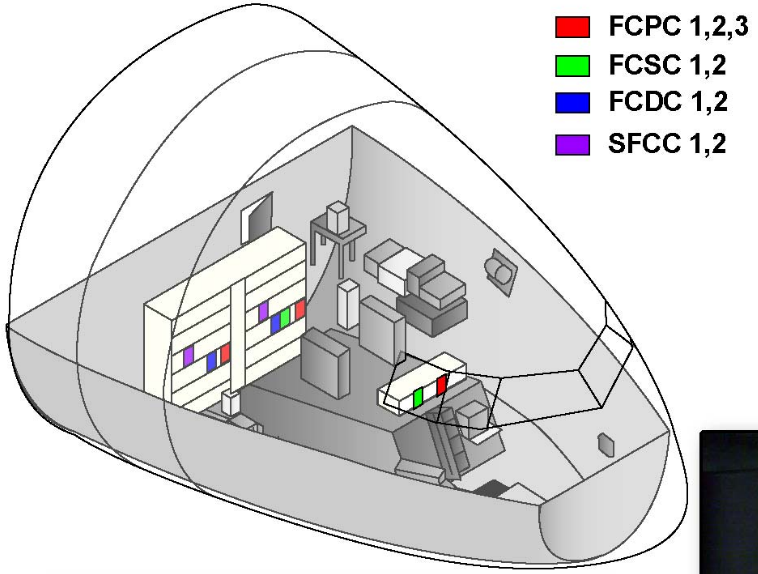
27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

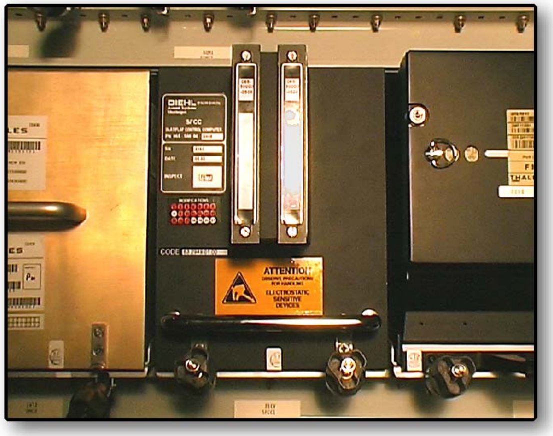
COMPONENT LOCATION

COMPUTERS

All the flight control computers are located in the avionics compartment.
The BCM is an electronic module supplied by the BPSs. It is located in the A330/A340 rear the aft bulk cargo or in the center fuselage for the A340-500/600.



FLIGHT CONTROL SECONDARY COMPUTER (FCSC)



FLIGHT CONTROL PRIMARY COMPUTER (FCPC)

FLIGHT CONTROL DATA CONCENTRATOR (FCDC)

SLAT/FLAP CONTROL COMPUTER (SFCC)

COMPONENT LOCATION - COMPUTERS

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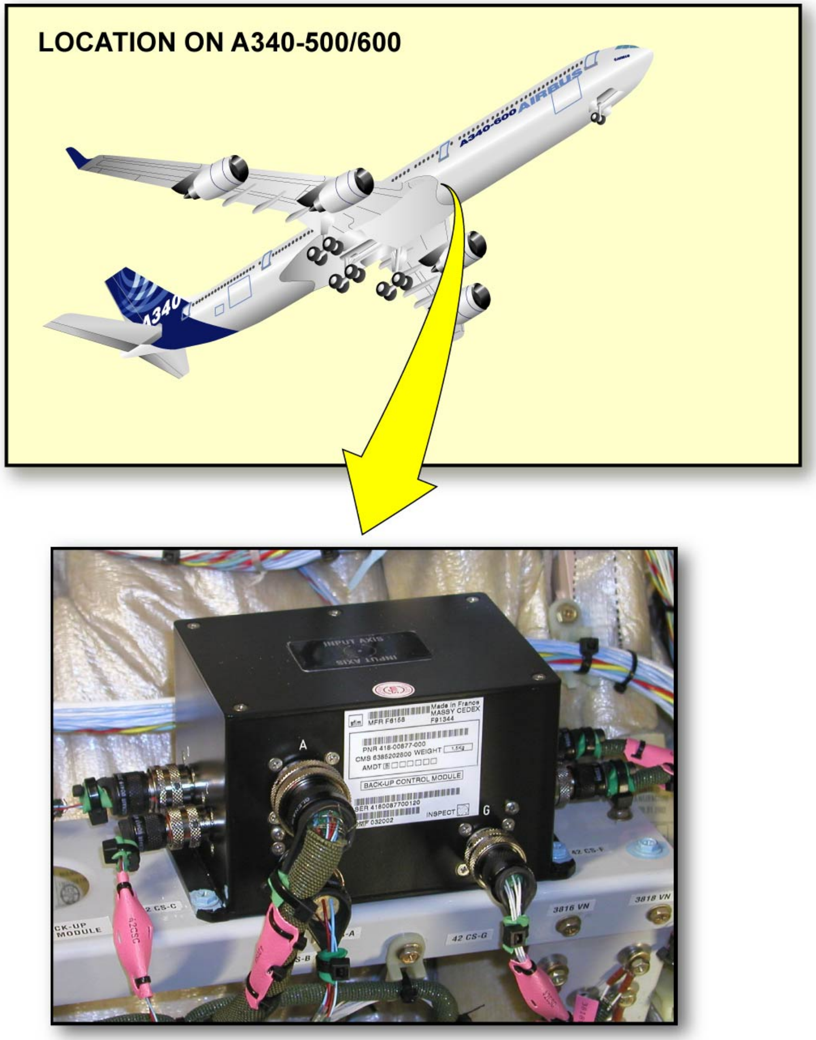
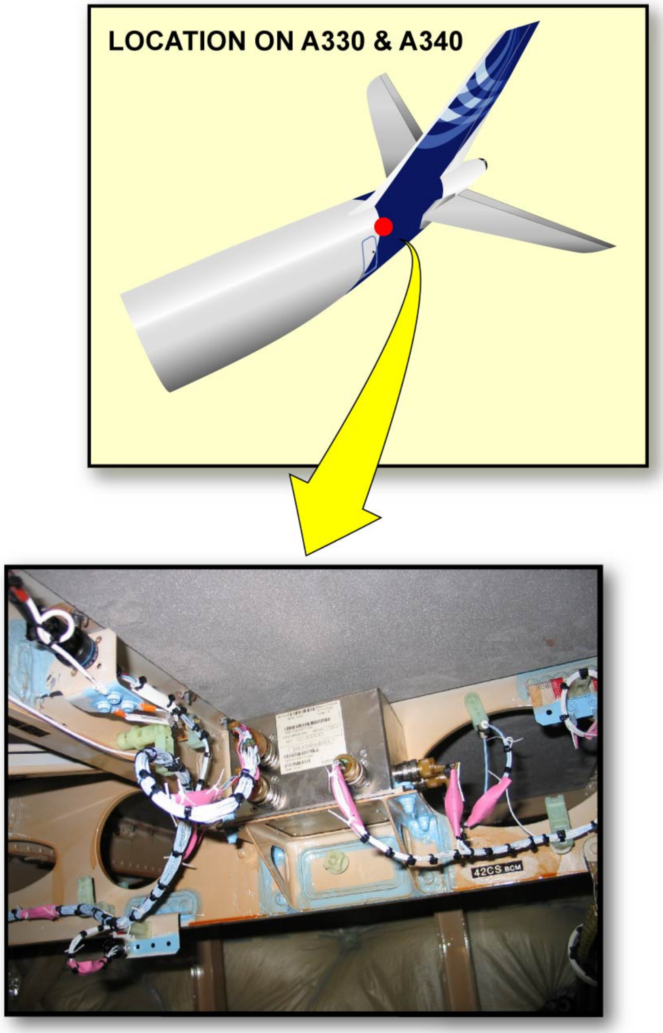


BACKUP CONTROL MODULE (BCM)



BACKUP CONTROL MODULE (BCM)

COMPONENT LOCATION - COMPUTERS

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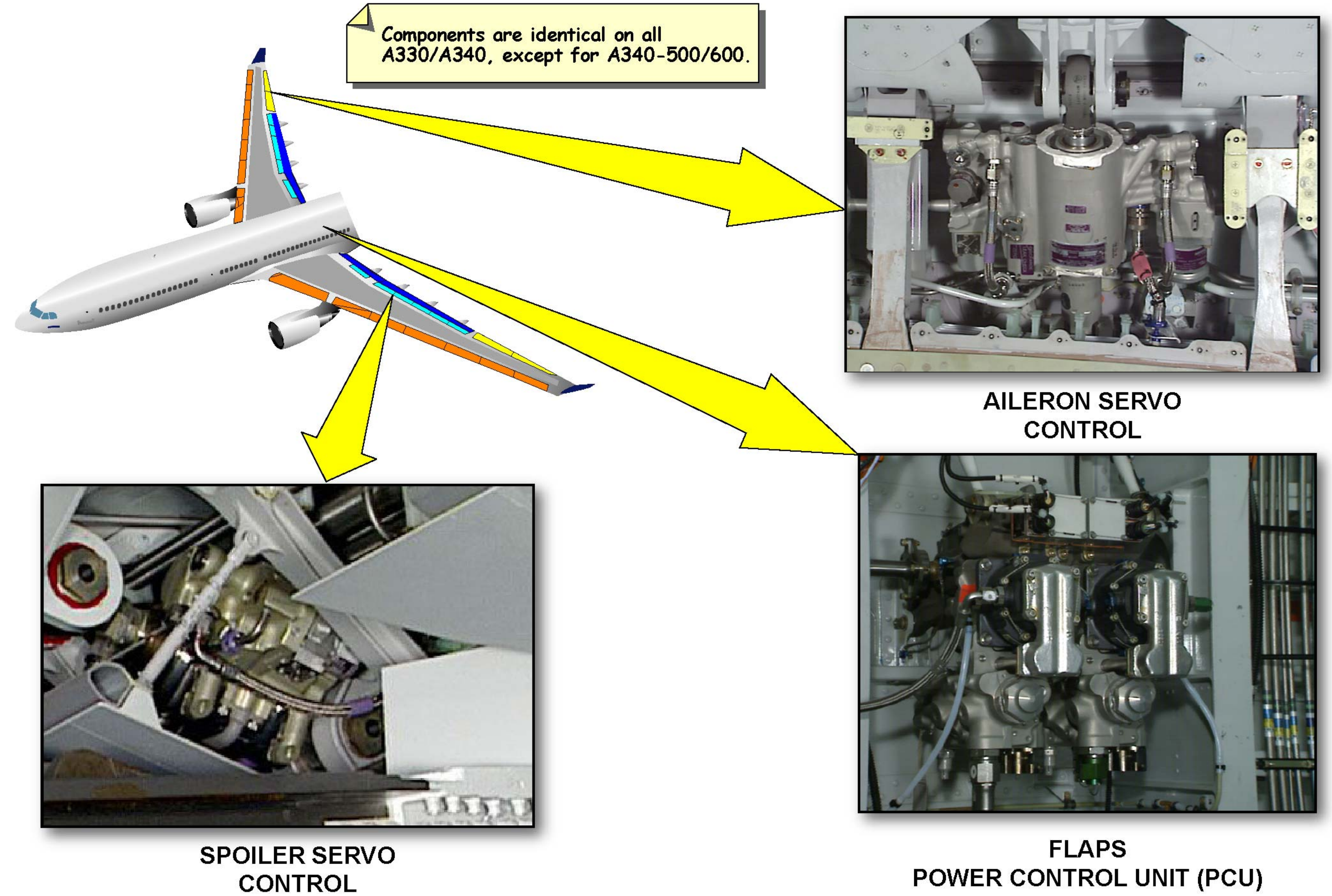
27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

COMPONENT LOCATION (continued)

ACTUATORS

Each aileron is actuated by two servo controls powered from independent hydraulic systems. Each spoiler is actuated by one servo control and by one hydraulic system. Each Flaps/Slats PCU includes two separate hydraulic motors powered through an electrically controlled valve block.



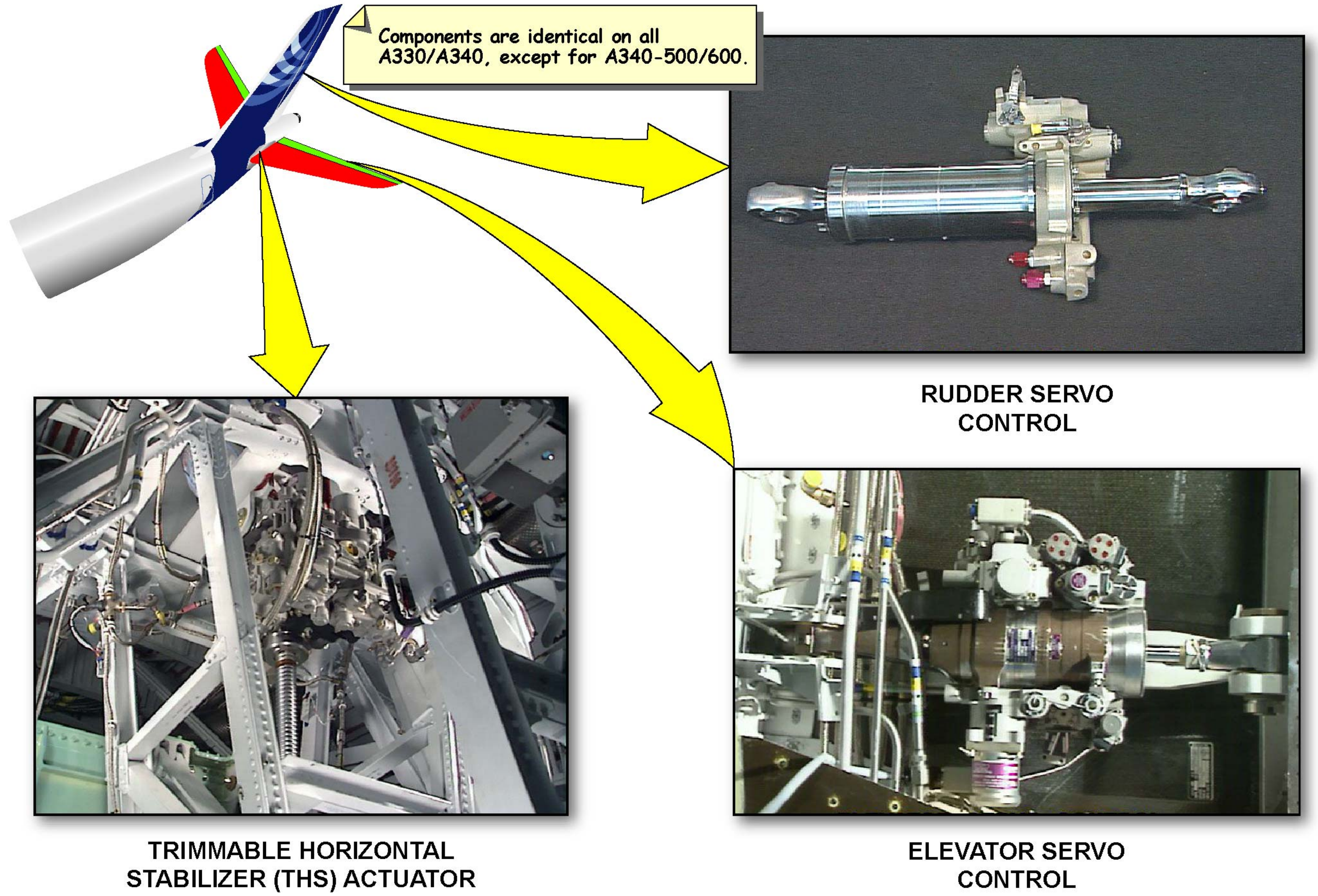
COMPONENT LOCATION - ACTUATORS

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

COMPONENT LOCATION (continued)

ACTUATORS (CONT'D)

The rudder is actuated by three servo controls powered from independent hydraulic systems. The servo controls are synchronized and operate simultaneously. THS actuator actuates the THS. The THS actuator is a gearbox powered by two hydraulic motors, which drive a ball screw jack, that directly moves the THS. Each elevator is actuated by two servo controls powered from independent hydraulic systems.



COMPONENT LOCATION - ACTUATORS (CONT'D)

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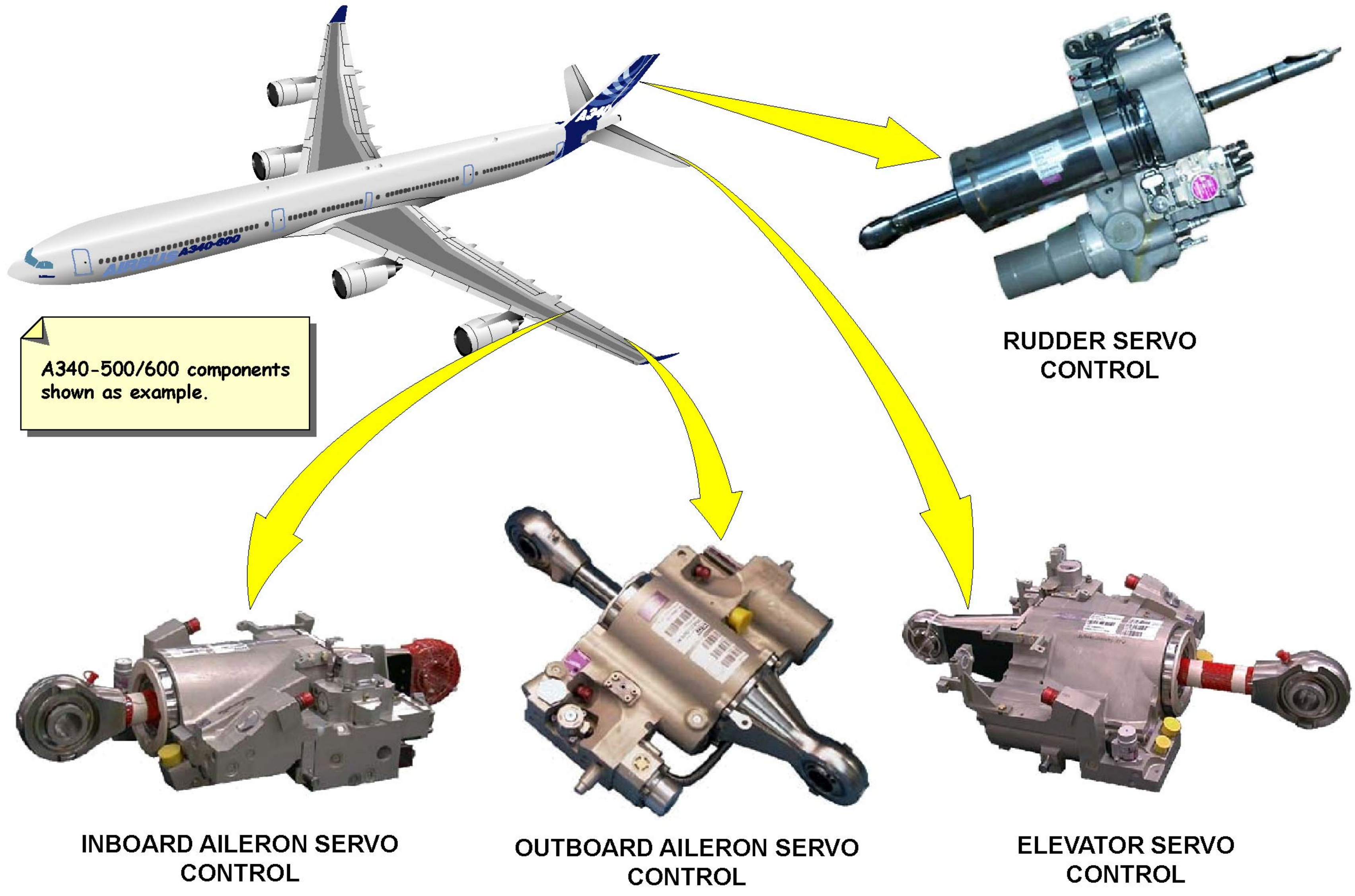
27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

COMPONENT LOCATION (continued)

ACTUATORS (CONT'D)

The A340-500/600 has larger actuators on the primary flight control surfaces.



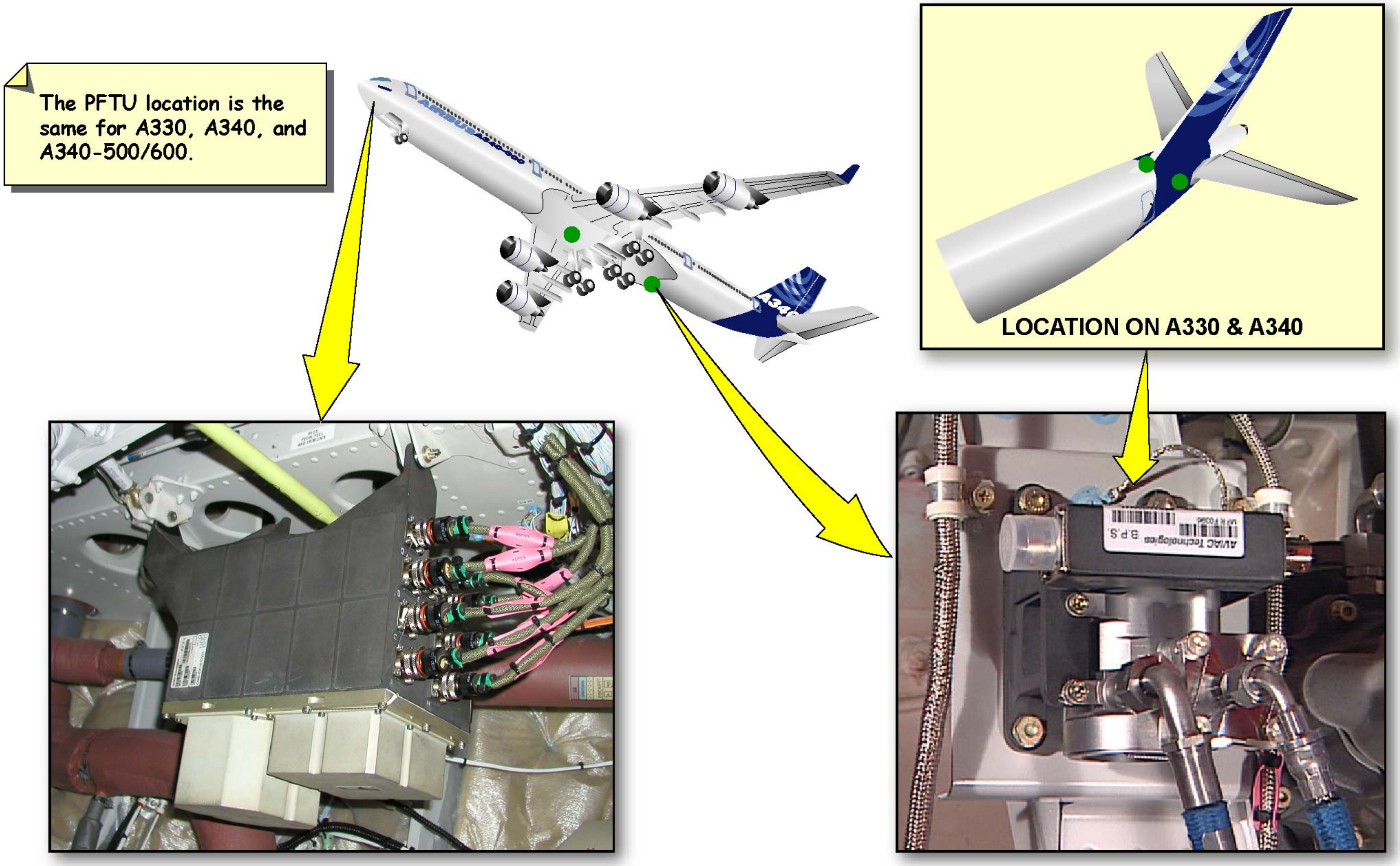
COMPONENT LOCATION - ACTUATORS (CONT'D)

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

COMPONENT LOCATION (continued)

ELECTROMECHANICAL DEVICES

The PFTU has an artificial feel which produces forces on the rudder pedals. The PFTU is located in the avionics compartment attached under the cockpit floor.
Two BPS are installed on the aircraft; each one is an electrical power generator supplied from one hydraulic system and gives electrical power to the BCM. The BPSs are located in the center fuselage for the A340-500/600, and in the tail cone for the A330 and A340.



PEDAL FEEL AND TRIM UNIT (PFTU)

BACKUP POWER SUPPLY (BPS)

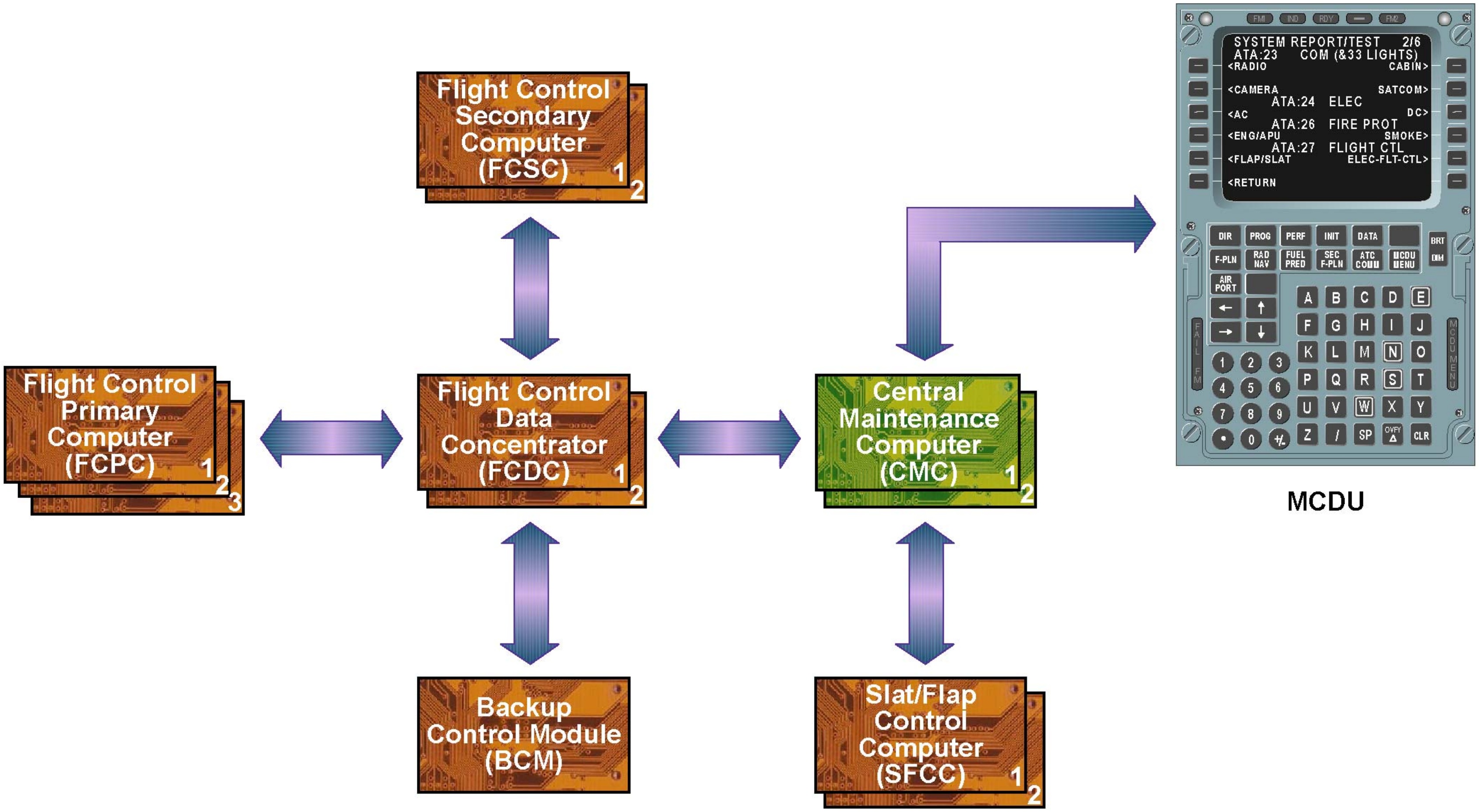
COMPONENT LOCATION - ELECTROMECHANICAL DEVICES

G6B08031 - G10T4T0 - FM27P5000000001

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

Each flight control computer has a BITE feature which tests, monitors and records failures to help in the maintenance and troubleshooting of the flight control system. The FCPCs and FCSCs send their data to the FCDCs, which interface with the Central Maintenance Computer (CMC). The SFCCs send their data directly to the CMC.



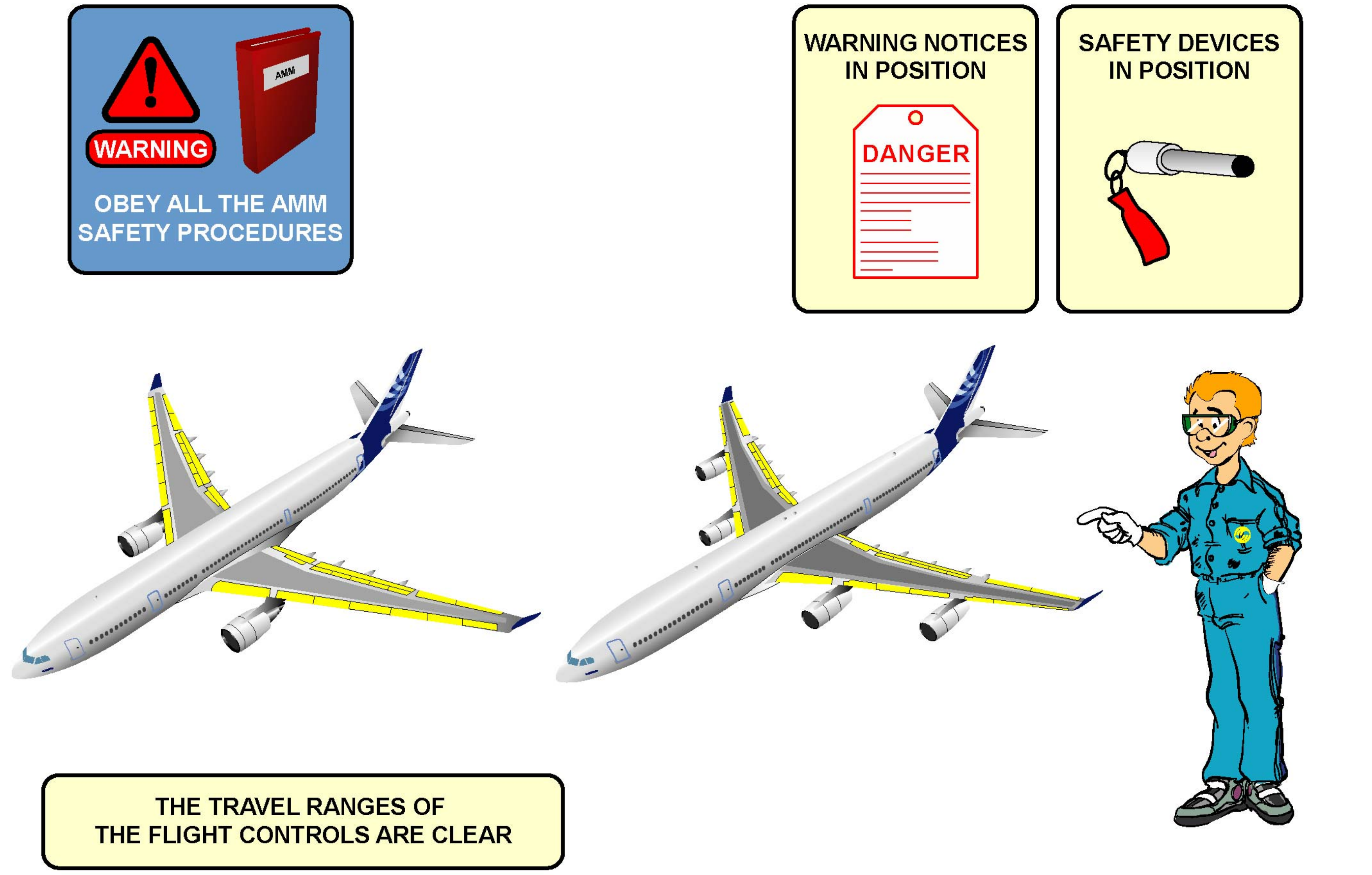
MAINTENANCE/TEST FACILITIES

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

When doing maintenance on the aircraft, make sure that you obey all the AMM safety procedures. This will prevent injury to persons and/or damage to the aircraft. Here is an overview of the main safety precautions relative to the flight control system.

WARNING: - MAKE SURE THAT THE SAFETY DEVICES AND THE WARNING NOTICES ARE IN POSITION BEFORE DOING MAINTENANCE ON THE FLIGHT CONTROLS.
- MAKE SURE THAT THE TRAVEL RANGES OF THE FLIGHT CONTROLS ARE CLEAR. MOVEMENT OF FLIGHT CONTROLS CAN CAUSE INJURY TO PERSONS AND/OR DAMAGE TO THE AIRCRAFT.

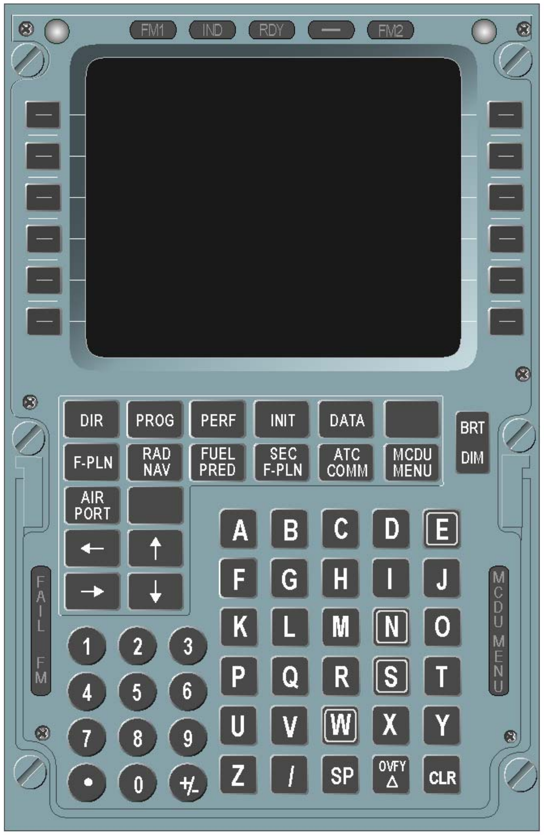


SAFETY PRECAUTIONS

27 FLIGHT CONTROLS SYSTEM PRESENTATION (1)

DYNAMIC TESTS

When you do operational tests, the flight control surfaces move.



DYNAMIC TESTS

AIRBUS

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